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In this issue



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frontispiece

Rat being fed in metal chamber devised by sanitary engineers at the National Institutes of Health, Public Health Service, to maintain germfree animals for research studies. See summary of paper on techniques of germfree animal culture on page 122.



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HARRIS, AD (Public Health Service), DEACON, W. E., TIEDEMANN, JOHN, and PEACOCK, WILLIAM L., Jr.: Fluorescent antibody method of detecting gonorrhea in asymptomatic females. Public Health Reports, Vol. 76, February 1961, pp. 93-96.

This study was designed to explore the usefulness of the delayed fluorescent antibody method for detecting *Neisseria gonorrhoeae* in females who had not been named as sexual contacts of male gonorrhea patients.

Routine-admission female jail inmates, 162 Negro and 51 white, who were found to be free of any sign or symptom of gonococcal infection were examined. Using the delayed fluorescent antibody method, *N. gonorrhoeae* was detected in 44, or 20.6 percent. Urethral, cervical, and vaginal sites were examined. Examination of all three sites produced

more positive findings than did examination of any one site or any combination of two sites. Reexamination of 74 women showed that, in this type of patient, additional positive sites could occasionally be obtained by a second examination.

Since the efficiency of the fluorescent antibody technique for detection of *N. gonorrhoeae* in the female compared with culture, isolation, and fermentation procedures had been determined in a previous study, culture comparisons were not made.

FITZWATER, JANET (Public Health Service): Bacteriological effect of ultraviolet light on a surgical instrument table. Public Health Reports, Vol. 76, February 1961, pp. 97-103.

A canopy table with ultraviolet irradiation as a means for maintaining the sterility of instruments and materials introduced into the wound throughout a surgical operation has been designed and evaluated.

Alteration of the reserve instrument table used routinely in the operating room to the canopy table is simple and inexpensive. The drape for the table is easily made and one nurse can arrange it to provide complete sterile coverage.

Irradiation is confined to the table to the degree that it is not necessary for any member of the operating team to have protective clothing, shields, or glasses.

Results of the bacteriological tests

show that the canopy table with ultraviolet irradiation produces a significant bactericidal effect. The canopy alone is not an effective means for reducing contamination of equipment and supplies on the reserve instrument table by airborne organisms.

Information supplied by the nurses who used the table and periodic observations indicate that the canopy table is practical.

This study serves to emphasize the concept that it may be timely to direct attention to confining irradiation to equipment and materials introduced into the wound rather than to irradiate the entire room. Further studies related to this concept may be profitable.

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S Y N O P S E S

DAUER, CARL C. (Public Health Service): *Mortality from infections. Public Health Reports, Vol. 76, February 1961, pp. 159-165.*

It is commonly believed that infectious diseases or processes are of minor importance as causes of death. However, it is estimated that about 100,000 deaths are reported each year in the United States for which infections are stated to be the underlying cause of death.

A study of mortality from a number of infections, mainly due to bacterial agents, shows a rising trend in numbers of deaths, some over a period of 10 years and others during the past 5 years.

Mortality from all types of septicemia has been steadily increasing since 1948, particularly septicemia caused by staphylococci. Sepsis of the newborn has shown a similar trend, a threefold increase from 1949 to 1958. The number of deaths from infections of the kidney has doubled during this period. Deaths

from several types of infection, including empyema and lung abscess, cellulitis, and meningitis (exclusive of tuberculous and meningococcal forms) have been increasing since 1955. These various types of infections of organs or systems take their greatest toll of life in the very young and in persons 45 years of age and over.

Examination of a large number of death certificates from all parts of the country indicates that still larger numbers of deaths occur in which infections are contributory causes. Additional studies are needed to determine, insofar as possible, the etiological agents responsible for infections which are considered to be underlying or contributing causes of death, and what proportion are hospital acquired.

RAVENHOLT, REIMERT T. (Department of Public Health, Seattle-King County, Wash.): *Poliomyelitis in an immunized community: Seattle-King County, Wash., 1959. Public Health Reports, Vol. 76, February 1961, pp. 166-178.*

One hundred and thirteen cases of paralytic poliomyelitis, largely or entirely caused by type 1 poliovirus, occurred in Seattle-King County, Wash., during 1959. Investigation showed that the outbreak began in June and ended in December. Median week of onset of poliomyelitis in children preceded the median week for adults by about 3 weeks.

Sixty-seven (59 percent) of the 113 patients were adults. Ages ranged from 9 months to 57 years, with a median of 22.5 years. Patients who died ranged in age from 19 to 42 years, with a median of 30.5 years. Seventy-two (64 percent) of the 113 patients and 5 of the 8 who died were male. Only two cases in pregnant women were recorded. Only 2 of the 67 adult patients had not had regular household contact with children during the month prior to onset. Swimming was not a significant factor in the epidemiogenesis of this outbreak.

The outbreak was probably due especially to the accumulation of an unusually susceptible preschool population in public housing projects and similar low socioeconomic groups. This accumulation indicates an unusual lack of natural immunization which, with changes in racial, socioeconomic, and geographic distribution of cases, suggests that extensive use of Salk vaccine did temporarily limit propagation of poliovirus in this community.

Two findings contrasted notably with earlier reports: (a) severity of paralytic disability showed no significant correlation with number of vaccine injections, indicating that the vaccine provides all-or-none protection, and (b) distributions of tonsillectomy and bulbar paralysis do not indicate that tonsillectomy at least 6 months previous disposes to bulbar paralysis.

Fluorescent Antibody Method of Detecting Gonorrhea in Asymptomatic Females

AD HARRIS, W. E. DEACON, Ph.D., JOHN TIEDEMANN, M.D., and WILLIAM L. PEACOCK, Jr., B.A.

GONORRHEA has not been as responsive to the wide usage of penicillin and other therapeutic antibiotics during the past several years as has syphilis in this country (1, 2).

Symptoms of *Neisseria gonorrhoeae* infection cause more infected males than females to seek adequate treatment and cure (3). It is therefore probable that the untreated foci of this infection are most frequently in the female. The *N. gonorrhoeae* has been shown to be present in varying percentages of females named as sexual contacts to male patients with gonorrhea (4-7).

A fluorescent antibody technique has been found to be an effective and rapid method for the detection of *N. gonorrhoeae* in the female (8). This study was designed to explore the usefulness of the fluorescent antibody method for detecting *N. gonorrhoeae* in females who had no signs or symptoms indicating gonorrheal infection and who had not been named as sexual contacts of male gonorrhea patients.

Methods

Two hundred thirteen routine-admission female jail inmates, 162 Negro and 51 white, were the patients for this study. These inmates received a careful speculum examination at, or

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shortly after, admission to jail, and only those found to be free of any signs or symptoms of gonococcal infection were selected for study.

Individual sterile cotton-tipped applicators were used for obtaining specimens from cervical, urethral, and vaginal sites of each patient. Each swab was immediately rotated on the surface of an enriched chocolate agar slant and then allowed to remain in the culture tube. Tubes were placed in a candle jar within 30 minutes, and the jar was placed in a 35° C. incubator approximately 2 hours later. After approximately 20 hours incubation, the growth on the slant was removed with the original swab, and moderately heavy smears were prepared. After fixation in 3 percent formalin, smears were stained with fluorescein-labeled *N. gonorrhoeae* antiserum and examined on a darkfield microscope with ultraviolet light. This entire technique has been described in detail by Deacon and co-workers (8), who refer to it as the delayed FA method for detection of *N. gonorrhoeae*.

Results

More Negro than white inmates were examined (table 1), and the number and percentage of *N. gonorrhoeae* identifications were slightly higher in the Negro group (20.9 percent) than in the white group (19.6 percent). However, in the Negro group, 10.3 percent of the sites examined were positive compared with 13.7 percent of the sites examined in the white group. This indicates that a slightly greater number of sites per person were positive in the white group (0.41) than in the Negro group (0.31).

The distribution of sites from which *N. gonorrhoeae* was identified in both Negro and white patients is shown in table 2. In the Negro patients the 50 positive site findings included 11 vaginal, 20 cervical, and 19 urethral. Four-fifths of these positive findings were from the cervical and urethral sites combined. The white patients had 21 positive site findings: 9 from the vagina, 5 from the cervix, and 7 from urethral areas. Twelve of the 21 positive site findings from this group (57 percent) were from the urethra or cervix. This difference between the findings in the Negro and white patients is further emphasized by the positive results from cervical sites only, with 12 occurring in the Negro group and none in the white group.

The number of positive findings at two or more sites was also dissimilar. *N. gonorrhoeae* was found in 13 of 34 patients in the Negro

Table 1. Fluorescent antibody identification of *Neisseria gonorrhoeae* from 213 asymptomatic female jail inmates

Race	Patients examined			Sites examined ¹		
	Total	Number positive	Percent positive	Total	Number positive	Percent positive
Negro.....	162	34	20.9	486	50	10.3
White.....	51	10	19.6	153	21	13.7
Total.....	213	44	20.6	639	71	11.1

¹ Vagina, cervix, and urethra.

Table 2. Number of sites ¹ from which *Neisseria gonorrhoeae* was identified by fluorescent antibody method, by race

Sites positive	Negro	White
All 3 ²	3	4
Any 2.....	10	3
1 or more.....	50	21
Vagina.....	11	9
Vagina only.....	0	2
Cervix.....	20	5
Cervix only.....	12	0
Urethra.....	19	7
Urethra only.....	9	1

¹ 639 sites examined.

² Vagina, cervix, and urethra.

Table 3. Results of reexamination ¹ of 74 female jail inmates by fluorescent antibody method for detection of *Neisseria gonorrhoeae* without intervening therapy.

Number of patients	Initial examination	Reexamination
51.....	Negative.....	Negative.
13.....	Positive ²	Positive. ²
6.....	Positive ²	Negative.
4.....	Negative.....	Positive. ²

¹ 7 days after initial examination.

² One or more sites (vagina, cervix, or urethra).

Table 4. Results of reexamination of 30 female jail inmates by the fluorescent antibody method for detection of *Neisseria gonorrhoeae* after penicillin therapy

Number of patients	Pretherapy examination	Post-therapy examinations		
		First ¹	Second ²	Third ³
17.....	Positive..	Negative..	1 positive ⁴ 7 negative	
8.....	Positive..	Negative..		
5.....	Positive..	Negative..	Negative..	Negative.

¹ 5 days post-therapy.

² 12 days post-therapy.

³ 19 days post-therapy.

⁴ At urethral sites only.

group and in 7 of 10 patients in the white group. These dissimilarities are, in part, associated with a greater frequency of positive findings at vaginal sites in the white group (9 of 10 positive patients) compared with the Negro group (10 of 34 positive patients).

Results obtained by reexamination of 74 patients 7 days after the initial examination are recorded in table 3. Techniques employed in reexamination were identical with those of the first examination. None of these 74 patients received antibiotic therapy between examinations. The *N. gonorrhoeae* was identified at one or more sites in 19 patients at the first examination and in only 17 patients during the second examination. However, the second examination produced positive findings in 4 of the 51 patients who had had negative findings on the first examination. Six patients with positive findings on the first examination were negative on second examination. The two examina-

tions combined produced positive findings in 23 (31 percent), compared with 19 (25.7 percent) for the first examination only and 17 (23 percent) for the second examination only.

Thirty patients were reexamined one or more times after therapy with 1,200,000 units of procaine penicillin in aluminum stearate (PAM). Results of the examinations of these patients are listed in table 4. Only one positive finding occurred on reexamination. This finding was from the urethral site only on the second reexamination (12 days after therapy) after negative findings had been obtained at the first post-treatment examination made 5 days after therapy.

Discussion

Most of the jail inmates used for this study had short sentences, and followup periods for reexamination were necessarily limited. All findings reported were obtained from female inmates at the jail, and no attempt was made to examine them after their release. These inmates were of similar economic status, so the findings obtained when divided into Negro and white classifications may not be reflective of the races as they exist at dissimilar economic levels or under other conditions. Neither could the assumption be made that results similar to those reported here would occur in segments of either race that had been otherwise selected. This study does, however, indicate that relatively large numbers of females may harbor *N. gonorrhoeae* without signs or symptoms of infection and that the fluorescent antibody method is a rapid and effective means of confirming this.

The effectiveness of any laboratory method for the detection of *N. gonorrhoeae* is dependent primarily on the efficiency of the examining physician in procuring adequate specimens from the proper site or sites in the female. Careless or casual examination by the physician could greatly reduce the number of positive findings and largely negate the value of the fluorescent antibody method, or any other laboratory procedure, for the detection of *N. gonorrhoeae*. In this study, great care was exercised in properly preparing the swab from each site that was examined. The fact that the

N. gonorrhoeae was detected in approximately one out of each five of the asymptomatic females examined indicates that the medical examination and swab preparations were efficiently performed.

The listings in table 2 indicate the importance of an adequate examination and the taking of specimens for examination from cervical, urethral, and vaginal sites. No single site would have produced half of the positive findings obtained when all three sites were examined. Although the cervical site in the Negro patients and the vaginal site in the white patients were most productive of positive findings, many positive findings would have been missed if only these sites had been examined. These findings are reflective of the small number of *N. gonorrhoeae* organisms present in asymptomatic infection of females and therefore would probably not be similar to results obtained when examining patients with evident gonorrheal infection.

Reexamination, without intervening therapy, was made of 74 randomly selected patients in order to ascertain the value of repeated examinations. Four patients who had been negative at first examination were positive when reexamined. This finding indicates that a single examination of all three sites in the asymptomatic female, no matter how efficient, may fail to obtain some positive findings that could occur in succeeding examinations. This fact is probably also reflective of the small number of organisms present in asymptomatic infection of the female and the consequent probability of missing them by any single examination. This point is also indicated by the six patients with positive findings on first examination who were all negative on later examinations. These findings indicate the continuing value of multiple examinations, even by fluorescent antibody methods, when diagnosis or cure of the patient is the problem at hand. A single examination by the fluorescent antibody method appears to have a relatively high detection quotient, however. Therefore, this could be the approach of choice in a gonorrhea control program since many individuals not institutionally confined would not be readily available for repeat examinations and since the additional cost of multiple examinations would need to be considered.

A smaller series of 30 patients harboring *N. gonorrhoeae* were examined one or more times after a single injection of 1.2 megaunits of PAM. This part of the study was not an attempt to evaluate the efficiency of this form of therapy but rather to ascertain the influence of this amount of penicillin treatment on the fluorescent antibody method for detection of *N. gonorrhoeae*. All 30 patients were reexamined 5 days after penicillin was administered. Thirteen of these were again examined 7 days later, and only five were present for the third post-treatment examination, 7 additional days later. During this relatively short reexamination period after penicillin therapy, the *N. gonorrhoeae* was detected at the urethral site in only one patient, at the second post-treatment examination, 12 days after penicillin therapy. At the time of this positive finding this patient had no signs or symptoms of *N. gonorrhoeae* infection.

The amounts of residual penicillin at any of the sites during any of these post-treatment examinations were not determined. In order that any residual penicillin that may have been carried from the site by the swab might be neutralized, penicillinase was incorporated in media slants at the rate of 10,000 units per milliliter. This was considered to be a necessary precaution for post-penicillin-therapy examinations. The single positive finding in this group after therapy indicates that the *N. gonorrhoeae* had been killed or reduced to numbers below the detection level of the technique employed, with the single exception. Reexaminations 12 to 14 days after therapy may detect treatment failures that would not have been noted by any examination at an earlier post-therapy date.

Conclusions

The delayed fluorescent antibody method is a rapid and efficient laboratory procedure for the detection of *N. gonorrhoeae* in asymptomatic females.

Jails may be a fruitful source of asymptomatic females harboring the *N. gonorrhoeae*.

Asymptomatic females may be a large untreated reservoir that continues to serve as a focus for *N. gonorrhoeae* infections.

Summary

Using the delayed fluorescent antibody method, *Neisseria gonorrhoeae* was detected in 44 (20.6 percent) of 213 female jail inmates who had no signs or symptoms of *N. gonorrhoeae* infection.

Urethral, cervical, and vaginal sites of these 213 patients were examined and *N. gonorrhoeae* was found at one or more of these sites in 44 patients. Examination of all three sites produced more positive findings than did examination of any one site or any combination of two sites.

Repeat examinations of 74 of these patients showed that additional positive findings could be obtained by a second examination.

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Bacteriological Effect of Ultraviolet Light on a Surgical Instrument Table

JANET FITZWATER, R.N., M.S.N.

THE INCIDENCE of surgical wound infections in hospitals is reported to have risen appreciably in the 1950's. Investigations aimed at determining the cause for this increase have revealed a number of potential causative factors.

Reports of studies of airborne bacteria and air currents in operating rooms have been useful to those interested in the control of post-operative infections. Reduction of the number of airborne bacteria in the surgical suite has been emphasized. Published reports (1-5) indicate that the number of bacteria in the air can be reduced by limiting the number of persons in the operating room, minimizing the movement of persons and equipment, changing face masks frequently, changing air repeatedly through effective filters, and cleaning rooms and equipment thoroughly.

The extent to which these measures can be effected is somewhat limited. Since it is inevitable that a significant number of bacteria will be present in the environment and there are limitations to efforts to reduce this number, it seems timely to direct attention toward reducing the number that are carried into the wound from the environment.

The reserve instrument table therefore assumes a particular importance. Most of the sterile instruments and supplies used during surgery and introduced into the wound throughout the operation are kept on this table. If the reserve instrument table can be kept free

from contamination by airborne bacteria throughout the operation, the number of organisms carried into the wound by instruments and other supplies will be reduced.

A means was sought by which this could be accomplished effectively, economically, and without encumbrance to the instrument nurse and other members of the operating team. Ultraviolet germicidal lights were considered.

Published reports by men who pioneered in the field of ultraviolet irradiation as a method of decontamination in hospitals were reviewed (6). The conclusion by Hart and associates was that ultraviolet irradiation is the most effective available method of sterilizing the air and should be used to protect the wound and sterile supplies until some other equally efficient and more desirable method is discovered. The improvement in postoperative results with the introduction of ultraviolet irradiation in the operating rooms at Duke University Hospital was reported by Hart and Upchurch. The work done at that hospital over a period of 23 years relating to the use of ultraviolet lights in the operating room resulted in the recommendation that bactericidal ultraviolet irradiation be used continuously as an addition to aseptic operating room technique (7).

Evidence in the studies reviewed indicates that ultraviolet germicidal lights are effective in reducing the number of airborne bacteria in the operating room. However, irradiation has an adverse effect on members of the operating team, and the additional clothing, hoods, and eye shields or glasses required for protection of personnel are cumbersome and costly.

It was envisioned that the lights might be

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strategically located so that irradiation is confined to the equipment introduced into the wound. This idea seemed sound; the real concern is not the number of bacteria in the room but the number that are introduced into the wound, since a concentration of bacteria in the wound can constitute a real hazard.

Bacteriological effectiveness, practicability, safety, and economy were considered necessary criteria for the means used to put this new concept into practice.

Problem and Purpose

The problem was to develop and test a unit, composed of a mechanical appliance attached to a reserve instrument table, that would reduce contamination of equipment and supplies introduced into the wound, confine irradiation, and not impede the operating team.

The broad objective was to aid in reducing postoperative infection of clean surgical wounds. The specific aim was to provide a means for maintaining the sterility of instruments and other equipment and supplies introduced into the wound throughout the operation.

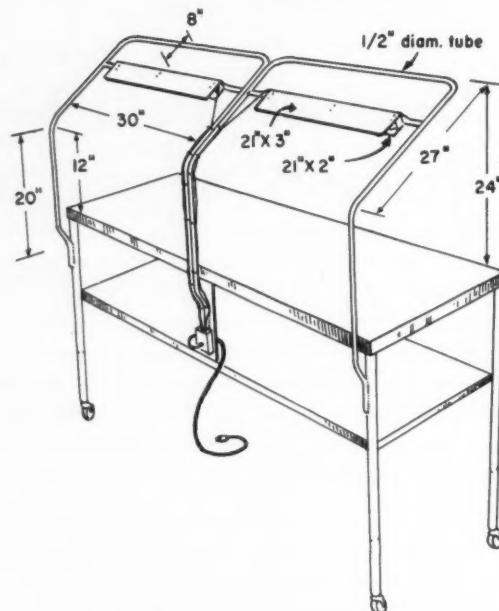
Design of Table and Drape

A stainless steel reserve instrument table, 60 inches by 24 inches by 40 inches, used routinely for major operations in the institution where this investigation was carried out, was modified by attaching an upright frame equipped with ultraviolet germicidal lights. The frame of two sections was constructed of stainless steel tubing one-half inch in diameter. It was attached to the horizontal axis of the table, 10 inches below the table top to facilitate draping.

A fixture for installation of one 15-watt ultraviolet germicidal lamp is incorporated in the center of each section. The greatest distance from the lights to the table top at any given point is 2 feet. At this distance irradiation with sufficiently intense ultraviolet, 2,537 Ångstrom units, is lethal to most micro-organisms (8,9). A metal shield is attached above and below each lamp to confine irradiation to the table (fig. 1).

Fabrication of a satisfactory drape for the frame was the next step. The drape was so

Figure 1. Instrument table fitted with ultraviolet lights



designed that it would completely cover the frame on the exterior and inferior surfaces except for the opening necessary to expose the ultraviolet lamps, be applicable by one nurse with no threat to sterility, permit immediate access to contents of the table and confine irradiation.

Four fitted muslin drapes were made for the frame. One tube, 31 inches by 42 inches, open on both ends, was used to drape the lower part of each section of the frame. The top part of each section was covered by a 31-inch by 10-inch tube open on one end. A muslin sheet, 108 inches by 72 inches, was placed over the entire frame so that it extended down 6 inches in front to provide necessary shielding. The tent-like arrangement was completed and the irradiation further confined by placing a 36-inch by 42-inch muslin sheet on either side. The front of the table was left open (fig. 2).

Tests of Ultraviolet Intensities

Tests were made to determine whether the intensity of the ultraviolet radiation escaping from the draped table was safe for operating-

room personnel. The routine apparel of the members of the operating team restricts exposure of the skin to the region of the eyes and the back of the neck. Thus, ultraviolet intensities at eye level were considered the most significant. Intensities at eye level were measured during an operation in which the table was used (fig. 3).

Because the instrument nurse occupies the area in which the ultraviolet intensities are the highest, it was necessary to determine the average amount of exposure she was receiving at eye level. Recordings over a 4-hour period showed that the instrument nurse faced the table 103 times for an average of 3 seconds each time, receiving an average exposure of 1.3 minutes per hour to an intensity of 3.0 to 6.0 microwatts per square centimeter. Maximum exposure of the instrument nurse for an average operation would be 5.2 minutes. Exposure to an intensity of 3.0 to 6.0 microwatts per square

centimeter for 5.6 minutes could not be considered significant in view of the recommended standards (10).

Bacteriological Testing and Usability

When construction of the frame, fabrication of a satisfactory drape, and measurement of ultraviolet intensities outside the canopy were completed, tests for bacteriological effects and usability were conducted. For the purpose of brevity the table will be referred to as the canopy table. This table was used for non-selective major operations in order to provide information which would not be restricted to one particular type of operation, one physical area, or a constant number of people. It was used for open and closed heart surgery, radical and simple cancer surgery, and general surgery, including infectious cases. It was placed in four different operating rooms. The number of

Figure 2. Draped instrument table with detail of tubular drape

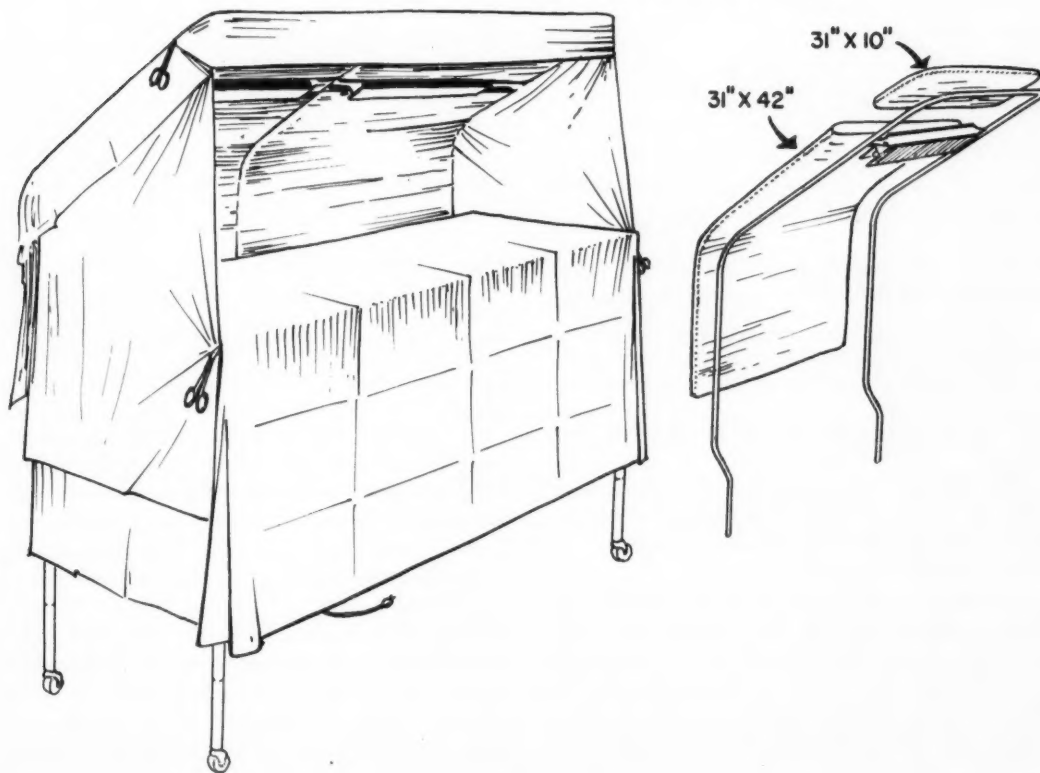
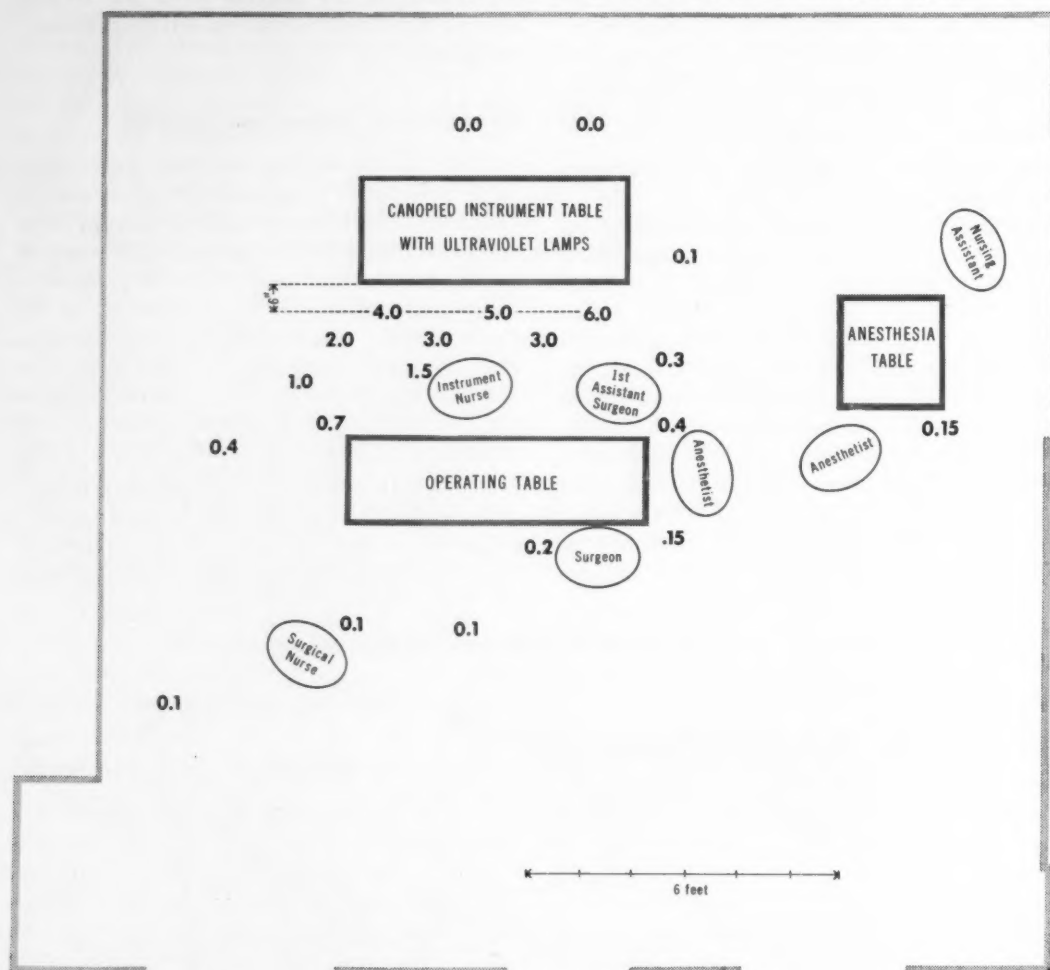


Figure 3. Ultraviolet intensities at eye level in microwatts per cm^2 during an operation



NOTE: Variations in the general pattern of decreasing intensities of ultraviolet light at increasing distances from the table are caused by reflections of light

from the canopy and instruments and the position of the meter.

persons in the operating room ranged from 5 to 20.

Nurses were assigned in the usual manner to keep deviation from normal routine at a minimum and to provide different viewpoints on the usability of the canopy table.

The same general method for the bacteriological testing was used in two series of tests. The first series included 10 operations using the canopy table with the ultraviolet lights off; the second series consisted of 30 operations using the canopy table with the ultraviolet lights on.

Petri dishes, 9.8 square inches in surface area, containing approximately 10 cc. of culture medium were used to determine the fallout of bacteria. The medium used was trypticase soy agar, a general purpose solid medium which supports growth of a wide variety of microorganisms (11).

After the sterile equipment was set up and prior to starting the operation, the instrument nurse was given sterile petri dishes. One or two petri dishes, depending on the series, were placed at random on the canopy table and on an

open sterile tray on either side of the canopy table and at the same height. Insofar as possible the tray was subjected to the same environmental conditions as the table with the exception of exposure to ultraviolet irradiation. Lids were removed from the dishes simultaneously and placed inside down beside the respective medium at the time the incision was made. The lids were replaced simultaneously when the wound was closed.

The exposure time ranged from 1 to 8 hours, depending on the length of the operation. The plates were incubated immediately following exposure, at a temperature of 37° C. for 48 hours. Following the incubation period, colony counts were done by two nurses independently of each other and recorded on a master sheet. It was found that the average difference between the counts made by the two nurses was less than one colony per plate. Therefore, the readings by only one nurse are given in the presentation and interpretation of data.

The general procedure was followed in both series of tests.

In the first series, in which the ultraviolet lights were off, one petri dish was placed on the canopy table and one on the open tray. Upon completion of the operation each plate was identified as to the date, exposure time, and location.

The second series included the following additional steps:

1. Immediately before setting up the sterile equipment the ultraviolet lights on the canopy table were wiped with 70 percent alcohol to remove any film which might have accumulated.

2. Five petri dishes containing medium were distributed. Two dishes were placed at random on the canopy table, two at random on the sterile tray. The remaining one, a control plate, was put on the unsterile utility table, and its cover was not removed, so that possible contamination when pouring the medium could be determined.

3. The ultraviolet lights were activated when the incision was made.

4. The petri dishes were marked with the code number, exposure period, date, and the name of the scrub nurse.

The practicability of the canopy table was investigated at the same time the table was be-

ing tested for the bacteriological effects. The time required to drape the table was observed and recorded, and the utility of the canopy table was discussed periodically with each nurse who participated in the tests.

Results

Data collected during the bacteriological testing of the canopy table without activation of the ultraviolet lamps are given in table 1. There is no evidence that the canopy table without ultraviolet irradiation reduced the number of colonies. The colony counts on plates in operations 1 and 5 show higher colony counts on the table than on the open tray. Results indicate that a canopy without ultraviolet irradiation is not effective in reducing the contamination of sterile equipment and supplies on the reserve instrument table by airborne bacteria.

Data collected during 30 operations using the canopy table with ultraviolet irradiation are recorded in table 2. All plates on the open tray showed growth with the exception of plate A in operation 15 which gave a negative result in an exposure period of 1 hour. Colony counts ranged from 1 to 121. No relationship could be shown between the number of colonies and the length of exposure.

Of the 30 pairs of plates used for testing the canopy table with irradiation, 26 were negative for growth on both plates. Three pairs of

Table 1. Colony counts from plates on open tray and canopy table without ultraviolet irradiation

Operation No.	Hours of exposure	Number of colonies per plate	
		Open tray	Canopy table
1.....	3	24	48
2.....	7	50	43
3.....	3	18	12
4.....	3	9	7
5.....	3	4	9
6.....	2½	11	10
7.....	2½	7	4
8.....	5	61	59
9.....	5	49	40
10.....	4	31	30
Total.....		264	262

Table 2. Colony counts from plates on open tray, canopy table with ultraviolet irradiation, and utility table

Operation No.	Hours of exposure	Number of colonies per plate				
		Open tray		Canopy table		Utility table
		A	B	A	B	
1	3½	60	51	0	0	0
2	2¼	16	20	0	0	0
3	¾	6	11	0	0	0
4	2	52	65	1	0	2
5	6	57	82	0	0	0
6	2½	18	17	0	0	0
7	4	23	29	0	0	0
8	4¼	71	59	0	0	0
9	3¼	20	30	0	0	0
10	2½	25	15	1	0	0
11	4	55	46	0	0	0
12	2¾	66	51	1	1	0
13	3	14	6	0	0	0
14	3½	6	8	0	0	0
15	1	0	1	0	0	0
16	5	23	21	0	0	0
17	3	16	14	0	0	0
18	1¾	33	37	0	0	0
19	8	107	121	0	0	0
20	2	7	16	0	0	0
21	2½	23	25	0	0	0
22	4	17	19	0	0	0
23	1	14	13	0	0	0
24	2	4	6	0	2	0
25	2	15	17	0	0	0
26	2½	8	14	0	0	0
27	1¾	8	11	0	0	0
28	2½	8	12	0	0	0
29	2	9	7	0	0	0
30	2½	27	16	0	0	0
Total	-----	808	840	3	3	2

plates showed growth on one plate; one pair showed growth on both plates. The exposure time of the five plates ranged from 2 to 2¾ hours. In operation 4, where one plate on the canopy table showed growth, the control plate also showed growth. Therefore, it is possible to speculate that the contamination on this plate may have been introduced in the preparation of the plates.

Since plates on the canopy table showed growth in 4 of the 30 consecutive operations, the claim of complete bactericidal action is not tenable. However, it is obvious that there was a very marked bactericidal effect.

Practicability

The practicability of the table was determined from the recorded time required to drape

the table and a summary of the comments of the 10 instrument nurses who used the table. Initially, the 10 nurses required from 6 to 10 minutes to drape the table. Repeated draping of the table reduced this time to an average of 3 minutes for each nurse.

Conversation with the four nurses who used the table most frequently revealed their reactions to the introduction of a new device and procedure. At first, all nurses were reluctant to use the table. They expressed a feeling of lack of freedom, attributable to the change from a completely exposed surface area to an exposure in the front only. They considered the initial time required for draping the table undesirable. Some stated that it was difficult to see when arranging instruments and preparing sutures under the canopy table before the lights were turned on.

After they had used the table three or more times, the nurses indicated that the initial problems were solved. To overcome the seeing difficulty, the spotlight was focused on the table while setting up. In a final discussion all nurses expressed a feeling of security in regard to the sterility of instruments, supplies, and equipment when using the canopy table with irradiation.

Summary and Conclusions

A canopy table with ultraviolet irradiation as a means for maintaining the sterility of instruments and materials introduced into the wound throughout a surgical operation has been designed and evaluated.

Alteration of the reserve instrument table used routinely in the operating room to the canopy table is simple and inexpensive. The drape for the table is easily made and one nurse can arrange it to provide complete sterile coverage.

Irradiation is confined to the table to the degree that it is not necessary for any member of the operating team to have protective clothing, shields, or glasses.

Results of the bacteriological tests show that the canopy table with ultraviolet irradiation produces a significant bactericidal effect. The canopy alone is not an effective means for reducing contamination of equipment and sup-

plies on the reserve instrument table by airborne organisms.

Information supplied by the nurses who used the table and periodic observations indicate that the canopy table is practical.

This study serves to emphasize the concept that it may be timely to direct attention to confining irradiation to equipment and materials introduced into the wound rather than to irradiate the entire room. Further studies related to this concept may be profitable.

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Training in Epidemiology for Nurses

Four 2-week courses in principles of epidemiology for nurses held during the summer of 1960 were so well received that the Public Health Service plans to continue its support of such workshops.

The courses were held at Catholic University in Washington, D.C., St. Anselm's College, Manchester, N.H., Texas Woman's University, Denton, and Incarnate Word College, San Antonio, Tex. Registered nurse participants meeting the requirements set by the colleges and universities received 2 hours credit toward either the bachelor's or master's degrees.

Subjects covered included basic principles of epidemiology and of statistics, the role of the laboratory in epidemiology, epidemiology of specific chronic and communicable diseases, and other related topics. Participants had an opportunity to apply theory learned to simulated field situations in group problem-solving

sessions. Pertinent audiovisual aids and literature handouts were also utilized.

Faculty included staff from the schools of nursing, State health departments, and the Public Health Service. Special Public Health Service consultants included Dr. Leonard Schuman, professor of epidemiology, University of Minnesota School of Public Health, and Dr. Kirk Mosley, associate dean in charge of special training, research program, University of Oklahoma. A total of 167 nurses representing hospital nursing, public health nursing, and nursing education attended the workshops.

Schools accredited by the National League for Nursing, Inc., and interested in conducting programs of this kind are invited to make inquiries to the Chief, Communicable Disease Center, Attention: Chief, Training Branch, Atlanta, Ga.

Secretary of Health, Education, and Welfare

Abraham Ribicoff, Secretary of Health, Education, and Welfare, was the first Cabinet appointment by President John F. Kennedy.



As Governor of Connecticut, Ribicoff administered a budget in his last term which devoted a third of its funds to education and two-fifths to health and welfare.

Under his leadership the State experienced the following gains in these programs:

- Consolidation of formerly independent agencies dealing with public health and medical treatment programs into one State department of health, with resulting improvement in the care and treatment of the mentally retarded, the chronically ill, and the disabled.
- An increase from \$27,900,000 in the 1953-55 biennium to \$45,200,000 in 1959-61 in expenditures for mental health, and bond authorization of more than \$20 million for capital construction at mental institutions.
- Modernization of the public welfare program by elimination of county care of neglected children in favor of a State-directed child care program, enactment of a comprehensive adoption law, an improved foster home placement program, and an easing of the financial burden on relatives of institution patients.
- Creation of a State Commission on Services for Elderly Persons.
- Adoption of legislation prohibiting discrimination in employment because of age.
- Adoption of a \$6 million program of construction of low-cost housing designed for the aged.
- Adoption of one of the Nation's most comprehensive medical care programs for the aged.
- Strict regulation of convalescent homes.
- Strengthening of the vocational rehabilitation program for handicapped persons.
- An increase in State aid to towns for education.
- An increase for higher education capital construction.
- Establishment of a minimum salary for teachers in State institutions.
- Adoption of a statewide teacher tenure law.

Ribicoff had been in office less than a year when Connecticut was hit by two of the worst natural disasters in its history. In 100 of Connecticut's 169 towns there was flood damage running into many millions of dollars. The Governor rallied recovery forces and encouraged urban redevelopment of flood-stricken communities with supporting legislation.

The year 1955 also saw 324 people lose their lives in traffic accidents. Despite misgivings by those who feared a tough policy would be political suicide, the Governor stuck to his plan to deprive every convicted speeder of his license for 30 days. Now the State has the Nation's lowest death rate for miles traveled. When the National Governors' Conference created a Highway Safety Committee in 1956, Ribicoff was unanimous choice for chairman.

Other accomplishments included:

- Abolition of county government, labeled by Ribicoff an anachronistic holdover from horse and buggy days.
- Enactment of a half-billion dollar highway construction program, taking full advantage of authorized Federal grants.
- Consolidation of State government structure, eliminating 46 separate and independent agencies.
- Enactment of an anti-erosion program to protect and improve beaches.

In 1955, he won the Governorship after a campaign which he devoted to describing his plans for the State. He won a second term in 1958.

Born in New Britain, Conn., April 9, 1910, he began working for a living while he was in grade school. Graduated from high school at the age of 16, he worked for a Connecticut manufacturer, attended New York University for a year, and then, while he continued working as a salesman, prepared to study law at the University of Chicago, where he was a member of the Law Review. He was graduated cum laude in 1933 and began practice in Hartford, home of Ruth Siegel, his wife since 1931. Elected to the legislature in 1938 and 1940, Ribicoff was appointed judge of the Hartford Police Court and headed a commission to study the relation of alcoholism and crime. In 1947, Ribicoff was appointed by Governor James L. McConaughy as a hearing examiner for the State Interracial Commission, now the Civil Rights Commission. He was a member of Congress in 1948 and 1950.

The **APHA** *conference report*

SUMMARIES OF SELECTED PAPERS

from the 88th annual meeting

AMERICAN PUBLIC HEALTH ASSOCIATION

and related organizations

held at San Francisco

October 31–November 4, 1960

*The **APHA** conference report*

With something like 500 participants in the program of the 88th annual meeting of the American Public Health Association and related organizations in San Francisco, October 31–November 4, 1960, only a minority are represented by papers summarized in this issue.

This conference report has several purposes. Primarily, it seeks to present in one package a broad view of the variety and excitement, the subtlety and complexity, and the progress and promise for human welfare of the many facets of public health practice. It aims also to broaden the immediate audience for the many speakers who at most were heard by only a portion of those in attendance, in themselves a small fraction of the public health working force. It is intended further to contribute to a growing appreciation of public health work as a distinct vocation in itself, with integrity, unity, and common aims and traditions lacking in a loose coalition of independent craft guilds.

The basis of selection is simple. About four-fifths of the talks were eliminated simply because the speakers did not provide a copy for this journal. Certain others were omitted because they did not, for a variety of reasons, lend themselves to effective summarization, or were scheduled for summarization elsewhere. A few others were omitted because they had had adequate attention in other media or were known to be under consideration for publication in full in the near future. Even with these eliminations, however, the remaining copy represents a body of outstanding contributions.

The staff of *Public Health Reports* writes these summaries at the invitation of the American Public Health Association, with the cooperation of the speakers quoted. For additional data or full elaboration of basic points, it is recommended that readers inquire of the sources.

Modus Operandi . . .

State Health Organization Geared to Future Needs

Changes of emphasis in public health required a reorganization of the New York State Health Department in 1947. Various modifications were made until a major reorganization took place in 1960, reported Dr. Herman E. Hilleboe, commissioner of health.

In 1958, administration and management units (fiscal management, general services, hospital business management, personnel administration, planning and procedures, and vital records) were placed in one group and coordinated with line units by an assistant commissioner for administration and management.

A second staff unit, also headed by an assistant commissioner, was given the public health research, development, and evaluation functions. This group was formed to help other units evaluate new and existing programs, to identify research needs, and to stimulate promising research in public health practice. The offices of biostatistics, epidemiology, and the driver research center come under this group.

Hilleboe maintained that health departments need four kinds of research: basic science, to increase fundamental knowledge of health and disease processes; epidemiological, to increase understanding of the natural history of diseases and causes of disability; administrative, to develop sound methods of planning and evaluation and explore better ways to make decisions, set priorities, and forecast results; and social science, to gain truer insights into the social and cultural forces that move people to support and participate in measures designed to improve health. These four research categories are interdependent, and inadequate administration of any one of them dilutes the value of new knowledge gained in any of the other three, Hilleboe warned.

Having the management and evaluation specialists with which to

make a survey, and experiencing at the time a turnover in executive personnel, the State health department was allowed from the outset to use its own staff. It was decided this was better than to have an outside team come in to survey the organization. Outsiders lend objectivity, the commissioner admitted, but he also pointed out disadvantages. When organization officials know they are under scrutiny and their old routines are being questioned, they sometimes do not function normally and it often is from this distorted perspective that the outside survey team makes its findings and submits its recommendations.

The first task of the "do-it-yourself" reorganization program was to determine the goals of the department, Hilleboe pointed out. To identify what changes in organization were needed, existing programs and emerging health problems had to be inventoried. From this, five needs became apparent:

- State-level planners and local health departments needed coordinating ties.
- Some control programs had to be slackened in proportion to their decline as health hazards.
- The attack on chronic diseases needed to be stepped up.
- Environmental hazards, such as ionizing radiation and air and water pollution, needed more intensive control.
- Better methods of assuring good hospital care at reasonable cost needed to be found.

Individual conferences were held with heads of the four operating divisions and chiefs of bureaus and sections, as well as a joint discussion with five regional directors who supervise health services throughout the State. The organizations of other State health departments and other State agencies in New York were studied.

The result of this extensive self-survey was the shifting, expanding, and strengthening of former units into five divisions: chronic disease

services, environmental health services, hospital review and planning, special health services, and laboratories and research.

The present pattern of organization of the New York State Health Department, concluded its commissioner, is ready to meet the problems of today and the challenges of the future.

Hospital-Centered Services Tried in Bergen County

A new pattern of providing comprehensive health services, centered on the Bergen Pines County Hospital in New Jersey, is a provocative challenge, declared Dr. Jesse B. Aronson, director, division of local health services, New Jersey State Department of Health.

Coupling environmental health services, offered on a contract basis to municipalities, to countywide medical services that augment and extend existing hospital services, he stated, is the unique feature of the New Jersey experiment.

Aronson explained how the project, now in progress, came into being. In New Jersey generally, municipalities have been reluctant to surrender responsibility for health matters. For several years citizens and professional groups in Bergen County, a New York City suburb, deliberated about more orderly and comprehensive health services. A plan for a series of regional health commissions in various parts of the county and a county health district was proposed; a public opinion study of ideas concerning the relative importance of outstanding health problems in the county was conducted, and a series of meetings, sponsored by the Bergen County Council of Social Agencies, were held.

At one of these meetings it was suggested that a division of preventive medicine and public health be set up as a unit of the Bergen Pines Hospital, and through it, traditional public health activities, although integrated into the hospital program, would be available to individual municipalities on a contract basis. A detailed prospectus of this

suggestion was accepted by the medical superintendent of the hospital, its board of managers, and the Board of Chosen Freeholders, the county's governing body.

Bergen Pines Hospital treats patients with tuberculosis, mental illness, and other chronic illnesses, and administers a number of high-quality services for county residents. In 1959 it cared for 5,260 inpatients and conducted an alcoholism clinic, child guidance clinic, speech and hearing services, and broad laboratory services, including analysis of milk and water samples. The medical superintendent and board of managers were considering the development of a home care program.

The division of preventive medicine and public health will be 1 of 13 divisions of the hospital. Heading it will be a well-trained specialist in public health who will also be health officer of the municipalities contracting for services. A nonmedical assistant director will negotiate with the municipalities contracting for sanitary inspection and other environmental health services and will supervise the staff performing these services.

A public health nurse director will provide liaison between hospital nursing services and the visiting nurse associations, the municipal board of health nurses, and the nursing staffs of the other four hospitals in the county. Nursing services will include maternal and child health, communicable disease control, adult health supervision, and the nursing services in a home care program.

Bergen Pines' excellent relationships with the four general hospitals in the county and the two-way flow of patients between them indicate that little difficulty will be encountered in transforming the restorative services at the Pines into a comprehensive rehabilitation center for patients drawn from all five hospitals, Aronson said. On the same basis, a home care program organized at the Pines might be able to serve patients from all five hospitals. He also envisions the addition of educational activities, screening programs, functional evaluation centers, and other activities essential to effective disease control.

Local boards of health and other municipal officials, voluntary agencies, the county medical society, and the public were informed, and they indicated approval of the hospital-centered plan. A price schedule was drawn up for several types of environmental health services which could be purchased by the municipalities, and a number of local boards of health indicated a desire to enter into contracts as soon as possible.

Aronson listed some favorable portents for the Bergen County plan. The county's population has a higher than usual level of social and political awareness and the average income is relatively high. There is a history of support for advanced programs in health and welfare. The medical superintendent and board of managers of the hospital have a record of progressive administration and receptiveness to new ideas in serving the people of Bergen County.

Hospital Laboratory Spots Outbreaks

Use of the hospital laboratory to alert public health departments, private physicians, and communities to infectious diseases was urged by Dr. Erwin Neter, director of bacteriology at Children's Hospital, Buffalo, N.Y.

In the past, many bacterial infections have been controlled by sanitation, immunization, chemotherapy, and other means, but many hospital-acquired infections still present a formidable challenge, Neter warned.

Recognition of infectious diseases and appropriate action by health departments depend on various conditions. Neter pointed out that clinical symptoms sufficient to send the patient to a physician must be present. The possibility of a particular infection must be considered if proper diagnosis is to be made. Appropriate laboratory procedures must be carried out if diagnosis cannot be made on clinical grounds. Occurrence of the particular infection must be reported to the health department, and there should be followup studies on the incidence of infections.

To this end the hospital laboratory may be a listening post for

health departments, aiding them and physicians to diagnose and control infections. Obviously, cultures cannot be taken by physicians on all patients with respiratory diseases, but selected samples can alert physicians to an increase in various types of infection.

Recognition of an epidemic, even though mild, has far-reaching implications, Neter said. In 1959 there was a marked increase in bacillary dysentery, 100 cases being recognized in a single laboratory while only 12 cases were reported from all other sources. During the outbreak the disease was introduced into both surgical and obstetrical units of a hospital. The medical profession was notified. Because of the forewarning, mothers and infants were isolated and an outbreak of dysentery in the maternity ward and nursery was prevented.

At Neter's suggestion, monthly meetings of laboratory directors and health department representatives are held to exchange information on infections which might otherwise go unreported. At these meetings, too, certain laboratories can be designated for study of a given group of infections which will result in more complete information on the incidence of the particular disease and facilitate its control.

Optimum Population As Community Plan

A plea to base community planning, including planning for health, on the optimum population that can fit together to create an efficient, effective, and livable environment was voiced by Robert C. Cook, president, Population Reference Bureau, Inc., Washington, D.C.

Speaking from demographic and genetic viewpoints, he opined that some kind of civic retrorockets are needed to check growth in metropolitan areas well short of decay and debility. These expedients will have to extend and modify current concepts of control through zoning regulations.

He quoted Dr. Reginald Isaacs of Harvard: "Our major health problems are becoming those inherent or

latent among masses of people living in dangerous propinquity, with increasing competition for space and sustenance, and with growing waste of human resources. . . . Given unlimited population and metropolitan sprawl, new definitions and practices of freedom and government will have to be devised." Community health cannot realistically be divorced from community planning, Cook said.

He suggested that significant trends in population change in the Nation and the community should be appraised. The details of the local picture—age, race, marital status, education, employment, income, and other characteristics—can be found for a particular State in the three-volume summary of the U.S. Census of 1960.

Cook listed some of the national trends that could be projected from the 1950 and 1960 census data.

- The net population gain, 28.9 million, in the past decade will be greater, an estimated 34.5 million, between 1960 and 1970.
- Ninety percent of the gain will occur in the 210 standard metropolitan areas, centered on cities of 50,000 or more, where 111 million people now live. Forty percent of the nonmetropolitan counties will show a decline.
- The population is simultaneously growing older and younger. In 1960, 40 percent of the population was under 19 years; nearly 10 percent were past 64 years.
- The dependency ratio (number of those under 20 or over 64 for every 100 in the working ages) is increasing. The ratio was 75 in 1950; it is expected to rise to 95 in 1960 and reach 100 by 1980.

Cook cautioned, however, that national trends are not a safe guide to appraisals of individual communities. He cited St. Petersburg, Fla., and Wheaton, Md., as communities where the proportions of oldsters and children varied widely from the national pattern.

Patterns of change through time also need to be appraised, he said. This is difficult; the indicators exist but they are not published. The telephone company has the most up-to-date information on population changes in a local community. Pos-

sibly its data can be made available to a community service agency on a confidential basis.

Cook declared that "a creeping inventory of the genetic constitution of a community" is essential to a comprehensive community health plan. Sickness in its manifold forms is not a single cause and effect reaction but often represents a complex interaction between the constitution of the individual and the environment, whether the disease is poliomyelitis, tuberculosis, or mental illness.

The course the tuberculosis infection runs depends on the environment and the constitution of the individual, he said. In the metabolic diseases such as diabetes, it is the inborn constitution of the person reacting to the total environment. The hereditary diseases, while comparatively rare, inflict no inconsiderable amount of suffering on the individuals and their families, he added.

As knowledge concerning these diseases increases, means of identification and control will be found, he predicted. And as knowledge of the hereditary nature of such diseases becomes general, it is to be expected that voluntary restriction of births will tend to reduce the number of affected children. The experience of genetic counseling agencies such as Dight Institute at the University of Minnesota testifies

Community Health

There are vast areas for development and enrichment of health services at the local level. The question at issue here is whether local health workers throughout the country are ready, or are getting ready, to accept the challenge and to grasp the opportunity to utilize fully their State and local administrative, research, service, and other resources in order to make maximum use of the Federal assistance offered.

Health services are becoming increasingly personal; they require more and more personal participation. It would seem reasonable then that the closer the administration of health services can be kept to the individual, the more effective and efficient such services may be expected to be and the more likely to gain the individual's active participation.

—From the address by the president of the American Public Health Association, Malcolm H. Merrill, M.D., M.P.H., director of the California State Department of Public Health.

to the deep sense of responsibility which many people feel concerning the perpetuation of such defects.

Cook concluded that if community health planning is first to emphasize demographic and human-biological values it may pioneer the way to a new era in which our cities would be the jewels of the future.

What Localities Can Do About Chronic Ills

Community-based investigations of the chronic diseases as a means of encouraging research by State and local health departments were proposed by Albert V. Hardy, assistant State health officer, Florida State Board of Health.

Research in public health has not kept pace with research in industry, the basic sciences, or the general medical sciences, he declared. He described public health research in the twenties and thirties and concluded that, after a long era extending into the fifties when health departments were absorbed in service activities, the climate for local investigation is changing.

He noted that the value of community-based research had been proved in the discovery of the association between cigarette smoking and lung cancer, the field studies indicating the nutritive elements in

the etiology of atherosclerosis and in dental caries, and in current studies of the significance of ionizing radiation as a factor in leukemia.

If health departments have responsibilities in providing services and control for persons with chronic disease, they must help to determine how best to attain control, Hardy declared. In public health there is an intense desire for better procedures since none of those current are completely satisfactory.

Uncertainty as to research methodology is an obstacle to the expansion of community-based research by health departments, he continued. Assistance is needed to formulate applicable procedures for community-based research, especially in those chronic diseases with multiple etiological factors. (A conference for that purpose, held in Pittsburgh, November 13, 1960, will be reported soon in *Public Health Reports*.) Methodology for administrative research is in an even earlier phase of development, he stated.

He cited as evidence of a renewed concern with research the establishment between 1956 and 1959 of research committees by the Association of State and Territorial Health Officers, the American Public Health Association, the College of Preventive Medicine, and the Association of Professors of Preventive Medicine, and the organizing of the Public Health Research Study Section of the National Institutes of Health.

To foster local investigation, Hardy advocated more intimate contact of local agencies with the recognized leaders in health-related research. He proposed relationships with those in public health similar to those already established with senior investigators of universities, hospitals, and research institutions.

Another step Hardy suggested was training researchers in cooperation with State and local health departments. Research training is now almost exclusively in an institutional setting; if research is to flourish in the health departments, investigators must be familiar with them and be fully trained and they must elect to continue their work in this environment.

A deeper appreciation of the potential of community-based research by those influential in the development of medical research and budgetary encouragement to initiate investigations are also essential, Hardy said. A promising development is the plan of the California State Department of Health to pool appropriate categorical grants into a local project grant fund. These are available on a competitive basis to local health departments for research, demonstration, and evaluation. This "seed money" permits modest beginnings and prepares investigators to compete more effectively for the substantial grant funds available, he commented.

Voluntary Agencies Help Screen Preschool Eyes

Creating awareness of a health need and demonstrating prevention or control are the functions of a voluntary health agency in a community, stated Burnetta Downing, executive director, California Society for the Prevention of Blindness, Los Angeles. These functions are served, she said, through direct service, screening, and professional or public education.

As an example of such activities by a voluntary agency she described how the California society advanced vision testing of preschool children. Prompt referral and early treatment are important for signs of eye trouble, especially eye muscle imbalance. But because young children cannot say they don't see well, not knowing how well others see, their vision defects are seldom spotted unless the symptoms are obvious.

To offset the lag between the ideal (a professional eye examination for every child before the age of 4 years), and actual practice, Downing explained, the National Society for the Prevention of Blindness encourages vision testing of preschool children by responsible, trained volunteers.

When it was learned that the California Congress of Parents and Teachers was looking for a project, it was suggested that the society be contacted concerning a pilot project with volunteers doing the screening.

The San Fernando Valley District was selected as the site, and a professional advisory committee, with representatives of every group affected by the project, approved the format.

When the demonstration was a success, the CCPT recommended that vision screening be undertaken by all its districts throughout the State with no modifications of the format except those approved by local professional advisory committees. In a 4-year period, 18,092 children 3 to 5 years old were screened.

Service organizations such as the Junior Women's Club, Delta Gamma alumnae, and Optimists Wives contacted the society and screened an additional 4,025 preschool children. Local departments of health asked that their volunteers be trained to conduct screening at well child conferences, and the public school systems requested similar services in conjunction with their preregistration programs. In Los Angeles County 400 parent volunteers are trained each year to test some 50,000 children enrolled in parochial schools.

For each of these programs, volunteers were trained to do the screening by the California society. Rarely is followup for referral 100 percent completed. The volunteers carry out a printed form type of referral which results in approximately 50 percent of those originally referred receiving early professional eye examinations. Second reminders from the volunteers result in approximately 50 percent of the remaining half receiving professional examinations. The local health department nurses then attempt to complete the followup. In general, 7 to 10 percent of those screened are referred for Snellen findings or observed symptoms. Approximately 5 percent of the total number screened ultimately receive professional treatment or correction.

Downing described other activities of her organization. At the request of local health departments and public and parochial school systems in various communities, the society has held institutes on eye health of children. Information activities include distributing several thousand pieces of literature and circulating

films to boards of education, community groups, and official and non-official agencies.

She explained that the California society gives no direct service to persons other than consultation and referral for professional care. Her agency, she declared, seeks to give constructive guidance based on current, acceptable professional recommendations commensurate with its ability to serve.

MD's in Administration Are Reluctant Dragons

Physicians in academic medicine, while they consider administrative activities unappealing, are not entirely unwilling victims of their choice of a career, according to a study reported by Dr. Mary E. W. Goss, New York Hospital-Cornell Medical Center, New York City.

Questionnaires returned by 507 physicians on the clinical faculty of a northeastern medical school or on the staff of its teaching hospital, informal interviews, and observations were the sources of Goss' data. Of the group, two-thirds were private practitioners with unsalaried part-time appointments in the medical school and the remainder were on salaried full-time appointments as instructor or higher or were research associates or hospital residents.

In interviews, physicians expressed the view expected of them by their colleagues: that administration is unpleasant and professionally unrewarding in comparison with direct patient care, teaching, or doing research. However, the combination of these activities with administration was found to be an institutional pattern for the full-time staff; 84 percent reported spending some or much time on administration. Also, this group expressed greater interest in administration than members of the part-time staff whose primary career commitment was to private practice, Goss reported.

Of 467 physicians who answered a question on interest, about 77 percent ranked administration lowest, 20 percent ranked it in between, and 3 percent ranked it high. Varia-

tions in interest in administration by academic rank among the full-time staff also suggested, according to Goss, that interest may account for willingness to spend time on administration only so long as these duties do not interfere with others. The low interest expressed by full professors and associate professors indicates that when administrative obligations become extensive, interest may be less significant than duty. In contrast, among assistant professors and instructors with less extensive administrative obligations, the motivational role of interest may be stronger.

From these findings Goss drew some practical implications for the recruitment and retention of physician-administrators in other organizational settings. If it is true that some physicians have a latent interest in administration, methods might be devised to learn of this interest before career choices within medicine have crystallized. She also suggested that since physicians who willingly accept administrative duties retain an interest in the physician's traditional tasks, this interest should be recognized by allowing time for at least some direct patient care, teaching, or research. This step might help attract as well as retain able physician-administrators.

Goss emphasized that these findings are not conclusive and pointed out the need for longitudinal research on the social, economic, and psychological factors that lead physicians and other professionals to become administrators.

Counties Try Industrial Management Methods

Techniques of industrial management are being applied to government agencies in the Detroit area as a result of the executive training courses, said Morton S. Hilbert, assistant director, Wayne County Health Department, Elioise, Mich.

The courses were a medium for adapting to government the advances in organization and management methods that have been

developed through the knowledge, experience, and research in this industrial center, he said. Over the past 5 years a majority of the administrators responsible for governmental functions at all levels in the six-county area participated in the training offered at Wayne State University.

The most recent 28-week seminar on metropolitan problems used the university's resources in political science, psychology, speech, education, sociology, English, business, and industrial relations, as well as a panel of outstanding speakers from industry, government, and other universities. Lecturers have been vice presidents and top-echelon executives of Ford Motor Co., American Motors, Chrysler Corp., Detroit Edison, Inland Steel Corp., National Bank of Detroit, the Detroit AFL-CIO, Dade County (Fla.) Metropolitan Authority, and Washington, D.C., Area Study, and faculty members from Columbia, Indiana, New York, and Syracuse Universities, University of Michigan, and University of California at Los Angeles.

The preliminary series was given for selected county officials with the cost borne by the civil service commission. Advanced executive training was formulated for those completing the first series. Although the direct benefits and long-range implications of the courses are difficult to evaluate, Hilbert said, there is evidence that many advanced methods and techniques of administration are being practiced, with favorable results, in government agencies.

He counted as side benefits of the seminars the fact that department heads and administrators have become acquainted with each other and with the workings of the various governmental operations in the Detroit area. Also after the lecture series was completed, a group of administrators organized monthly meetings for informal discussions of their management difficulties.

Hilbert also discussed some of the findings of industry applicable to government. After spending large sums of money to develop organizational programs and training innu-

merable junior executives, industry concluded that the old-fashioned dictatorial boss should be replaced with group management techniques, with the team approach as the indispensable tool.

Essential to the team approach are understanding and clear-cut definitions throughout all echelons of the functions, relationships, and responsibilities of each segment of an organization; clearly established lines of progression; and proper delegation of responsibility while maintaining authority to assure the attainment of objectives.

Management has the responsibility, according to Hilbert, of getting the wholehearted support and interest of every staff member by developing a program by which employees become enthusiastic about their individual contributions to the organization.

How To Choose and Use Behavioral Scientists

What kind of behavioral scientist to choose and how to use his services effectively were explored by Dr. Irwin M. Rosenstock, assistant chief for research and evaluation, Research and Development Branch, Division of General Health Services, Public Health Service.

He described the objectives, variables in data collecting, and methods of the cultural anthropologist, the sociologist, and the social psychologist and summed up the aims of the three disciplines. Anthropology is concerned with the restraints of the total culture, sociology with the consequences of group membership, and social psychology with the consequences of social and unique personal forces.

Cultural anthropology can play a key role where little is known of a particular population or subpopulation by identifying its customs, traits, and life values. Sociology is particularly useful in identifying or describing how groups influence their members to accept or reject beliefs necessary for sound health behavior. Social psychology is useful in identifying the nature of the motives or beliefs that, in interac-

tion with social forces, determine the individual's response.

In Rosenstock's opinion, the variables used in cultural and sociological studies are not easily changed by health workers, while some of the variables of social psychology are amenable to change. To the extent that the health worker is prepared to adapt his program to fit the personal characteristics of his clients, any of the three disciplines may provide useful information. If he wishes to change or use some of the personal attitudes or behavior of his clients, he said, studies of psychological variables will frequently be useful.

The public health administrator's final choice of a behavioral scientist should be based on the amount of knowledge already available about the population toward which his program is directed, the kinds of activities that, on the basis of current data, seem possible, and the intelligence and training of the particular candidate.

Rosenstock offered some suggestions to public health administrators who wish to achieve effective collaboration with behavioral scientists. Orientation of the scientist to the function of his unit and his agency's goals is essential because the behavioral scientist has little or no knowledge of the public health field. The newly qualified behavioral scientist should probably first be given a rea-

sonably specific problem to attack with some independence in setting hypotheses and methods of study. With increasing experience he may safely be given increasing independence, including responsibility for developing an entire program of work, Rosenstock said.

He listed some stumbling blocks to understanding between the public health practitioner and the behavioral scientist. The practitioner's focus on the accomplishment of some practical end often tangles with the scientist's aim of establishing in a systematic manner some relationships among variables, regardless of whether it serves a practical purpose. Also, words common to most disciplines but with distinctly different meanings in individual ones, "behavior," "attitude," and "hypothesis," for example, are particular troublemakers, he said.

However, behavioral scientists can learn that a health need will not sit still pending the completion of a complex, long-term study and that the program administrator is responsible for solving a real problem rather than obtaining interesting findings, Rosenstock declared. Administrators can learn that there is nothing so practical as a sound theory and that taking the time to study a practical problem adequately may delay the solution temporarily, but can pay increased dividends in the future.

Medical Care . . .

Does Medical Care Meet Consumer Need?

A broader and more vigorous approach to appraisal of the quality of medical care was urged by Dr. Michael M. Davis, consultant in medical administration, Chevy Chase, Md. Indexes of quality of medical services are available, but "we do not employ them boldly enough," Davis said.

Information on utilization, supply, and organization of providers, and geographic and economic accessibil-

ity are needed in order to understand the medical services of a nation, Davis stated.

The kind and amount of services used by rural, urban, economic, age, and racial groups, and the diseases prevalent in an area for which preventive or curative measures are potentially available all affect data on utilization of medical services, Davis said. Information on percentage of total services provided by government agencies at all levels, insurance plans, voluntary organizations, and proprietary bodies is necessary for determining the sup-

ply and organization of providers of service.

According to Davis, "Medical care is a two-way street: one side the providers, the other the recipients." The way a patient is treated as a person, in the clinic, hospital, or doctor's office, often has definite therapeutic value. So far, most criteria of quality of care have concerned the providers, but the time is ripe for some basic research into consumer satisfaction.

In Davis' opinion, increased specialization and the elaboration of material facilities require coordination through group practice or otherwise, in order to attain unity and continuity of personal services to patients.

The concept of the hospital and clinic as centers of medical service, instead of as workshops for treating episodes of acute disease, requires that hospitals and clinics accept a continuing responsibility for the personal care of individuals. Medicine in the future will emphasize health maintenance and rehabilitation of function, with provision of unity and continuity of service and the recipient's satisfaction with his services even more important than they are today. Consequently, Davis concluded, "I plead for research in order to determine criteria to define unity and continuity of service and the elements which create satisfaction or dissatisfaction on the part of the patient."

How to Measure Medical Prices

In an effort to help establish a sound basis for measuring the real costs of health services, a group of economists breakfasted together during the APHA conference to hear and discuss the views of Kenneth J. Arrow, professor of economics, Stanford University, Stanford, Calif.

The meeting concentrated on index numbers. Wartime dissatisfaction with the use of index numbers to measure the real purchasing power of wages led the Department of Labor in 1945 to change the title of the Cost of Living Index to the Consumers' Price Index. The basic

point of Arrow's comments was that index numbers serve to measure the dollar's capacity to purchase satisfactions rather than an established list of goods and services. For this reason, he explained, variations among purchasers and changes in their needs and desires must be considered along with changes in prices and character of goods and services. It was commented that the goods available in 1945, sulfadiazine, for example, may be less satisfactory than goods available in 1955, such as penicillin. Considerations of quality and variety of commodities, he said, make the measurement of price change an arbitrary and at worst an unanswerable challenge.

Customarily, an index number compares the prices of a given set of satisfactions to their prices in a base year. That is to say, it relates the current prices to those of a base year, given identical baskets of goods. Since, in a changing market, a consumer tends to buy cheaper, if not better goods at lower prices, the index tends to exaggerate any increase in the price of satisfying consumer demands.

Arrow's criticism of the consumer price index, he said, was not related to its technical formation but to its basic theory, not to the quality of current index numbers but to interpretations placed upon them. For example, he pointed out that the importance of different items in the consumer price index might be valid for a base year, but are likely to change as purchasing patterns change. For the suburban family, transportation assumes a relatively greater importance; and for the aging couple, medical costs grow in significance. Hence, the index number should be adjusted for changes in the distributions of income, residence, age, and so forth.

The base year itself, he said, is an arbitrary element in determining satisfactions, and probably ought to be no more than a few years behind the current year, using the latest prevailing formula.

Arrow suggested that a true appraisal of the costs of medical care might be achieved with a battery of index numbers, rather than a single indicator. A set of index numbers

for various income groups would permit differentiation of the cost changes. Other index figures might be developed, he said, to reflect the different needs of consumers according to location, age, or family size.

He posed the question of whether it was practical to prepare a separate index for medical costs, without regard to expenditures for food, shelter, and transportation. Since the index must be based on studies of family budgets or spending patterns, he pointed out that a compulsory outlay for medical care tends to reduce outlays for other satisfactions.

The question of measuring quality of medical care, he said, was also a critical issue in developing measures of satisfaction, especially with respect to goods and services new to the market.

Simply to illustrate methods of measuring costs for medical care for different income groups he demonstrated how one might interpret data which indicate that, while medical costs in the past 10 years have become a larger share of the total gross national product, the percentage of income devoted to medical care declined among families with larger incomes. This implies that, at each real income level, the percentage spent on medical care increased. Since medical costs, according to the medical care component of the consumer price index, rose relative to other prices, one might have expected a shift away from rather than toward medical care.

A possible explanation for this apparent contrariness, Arrow suggested, was that the quality of medical care had improved. For example, health insurance, he said, implied a quality change, because it purchased security as well as services.

Assuming a constant demand for medical services, he offered a formula for estimating limits to the quality change. As applied to budget studies made in 1950 and 1953, they indicated that the quality of medical care had declined slightly for the low-income group and improved for others. Assuming a constant quality of medical care, the

formula indicated that demand may have declined less in the low-income group than in others. However, the calculations must be regarded as illustrative because the two budget studies were not completely comparable. Arrow also demonstrated that if a family income is divided by the index of consumer prices, it might be inferred that real medical care prices had increased; but if the income is divided by the index of the medical care component alone, it might be inferred that real medical care prices had declined. Since these theoretical possibilities bear directly on insurance rates, government budgets, and industrial plans, it was observed, the issue was not academic.

During the discussion, Charles Roumasset, Department of Labor, pointed out the practical difficulties and expense of developing index numbers with the refinements suggested by Dr. Arrow, although he complimented Professor Arrow on his past recommendations which had led to specific improvements in the Consumer Price Index.

Need To Train Future Medical Administrators

Medical care administration is a professional discipline in its own right. It is not an offshoot of clinical medicine or of business administration but a field of work which requires extensive training in the fundamentals of the biological and medical sciences, social medicine, the social sciences, and the tools of administration. So stated Dr. Milton I. Roemer, director of research, Sloan Institute of Hospital Administration, Cornell University, Ithaca, N.Y.

Organizations sponsoring medical care programs include government agencies, voluntary agencies providing health services, general organizations with health functions, and health institutions and related agencies, Roemer said. About 150 types of positions are available in these agencies, probably aggregating 5,000 administrative positions, not counting administrators of general hospitals.

Background and Training

The backgrounds of medical care administrators are varied, but few include formal training in medical care administration. Among 73 administrators of a network of large medical care plans, only 2 had graduate training in hospital administration; 46 percent had no degree, Roemer reported. Only 20 percent had had any experience in the hospital or welfare field. Full-time medical care administrator members of the American Public Health Association had somewhat more advanced educational backgrounds; 80 percent had a university degree higher than a bachelor's degree, and 42 percent had had administrative experience, although in other fields.

Universities and schools of public health are not training enough students for medical care administrative jobs, and hiring agencies often are not aware of the qualifications needed for such positions, he declared. The heterogeneity of jobs has made it difficult for universities to formulate formal courses of training in this field. However, schools of public health and hospital administration need to give increased academic attention to medical care administration, and agencies in this field need to upgrade their employment standards for administrative personnel.

Roemer believes that proper training for careers in medical care administration requires 3 or 4 years of graduate work. This would be more effective than the usual 1-year master's training, yet far less wasteful of economic resources than the present practice of superimposing further postgraduate study and field experience on physicians, he said.

Welfare Agencies Seek Drug Expense Control

Forty-four States and Territories have adopted the "vendor payment" method of meeting at least one form of medical care. This procedure, authorized under the Social Security Act, provides for the Government's matching State medical care expenditures used by welfare agencies for their clients, reported Dr. Alonzo

S. Yerby, executive director of medical care services, New York City Department of Health.

Direct payment to pharmacists for drugs is made by 27 States, but 2 States make these payments only in connection with hospitalization. The remaining 24 States and Territories make no specific payments for drugs but may include the amount in individual monthly grants for purchase of medications. In such circumstances, however, there is no assurance the extra funds will be spent for drugs, Yerby warned.

Though the Bureau of Public Assistance of the Department of Health, Education, and Welfare spent more than \$21 million for "drugs and supplies" in 1957, representing 14 percent of the total amount for medical care to those States which itemize drug expenditures, comparisons between welfare medical costs and the entire welfare program are difficult to define. There is considerable variation from State to State in items of care for which payment is made, Yerby pointed out.

In New York State, drugs and other medical supplies accounted for approximately 10 percent per month of all medical care services. New York City spent 3 percent of its medical allotment on drugs alone. In Albany County 21 percent of the total amount for medical care went to payment for drugs.

Vitamins, antibiotics, and tranquilizers represent approximately 40 percent of all prescribed drugs; tranquilizers alone account for 15 to 20 percent of the total. An investigation showed old-age assistance cases and nursing home patients received the majority of this type of drug; an occasional patient received two or three different tranquilizers at the same time. Surveys of the use of drugs in welfare cases in New York State revealed some patients received as many as 15 different drugs during a 1-month period. Prescriptions which should have lasted a month were refilled within a week or 10 days.

There is also considerable difference in the cost of identical drugs which has led welfare agencies to seek some form of control. Curbs

can be effected through the welfare of the client, pharmacist, and physician. Controls directed toward the patient would require all medication to be obtained by written prescription of a physician and the prohibition or limitation of all refills. A fixed markup over the wholesale cost would help to control expenditures to pharmacists. Prior authorization, limitation on refills, and review of prescriptions, with particular stress on restriction of tranquilizers, would be a means of economy.

Measures To Evaluate New Drug Products

An effective program for clinical evaluation of drugs requires that medical need and scientifically established criteria be the primary factors governing the development, production, and trial of new products, according to Dr. Mindel C. Sheps, associate research professor of biostatistics in the Graduate School of Public Health and associate research professor of preventive medicine in the School of Medicine, University of Pittsburgh.

The clinical value and limitations of a drug can be determined only by comparing its effect with the effect of alternative methods of treatment, after extensive experience and critical evaluation, Sheps said. However, the number of new drugs being developed and the acceleration in their rate of obsolescence have resulted in increased pressure for each new drug to go on the market quickly, and lasting value has become a secondary consideration, she stated.

Of the nearly 6,000 new products introduced in the 12 years 1948-59, only 491 were new chemical entities. Of the 63 new chemical entities introduced in 1959, only 29, or 46 percent, were truly new; the remainder were either new salts of old products or derivatives of known drugs.

Hospital staffs, administrators of medical care programs, and individual physicians all must demand convincing evidence of the value of a drug before they accept it, Sheps said.

At present no organization, official or unofficial, is responsible for testing all drugs for chemical effectiveness, although a number of medical centers are studying methods of refining techniques for evaluating drugs and are training physicians in these methods. However, these centers investigate only drugs of interest to themselves, and their findings usually are not immediately available.

In Sheps' opinion it is an essential requirement of a rational, scientific, and ethical program for the clinical evaluation of drugs and their subsequent utilization in practice that a way be found to govern the development, production, and trial of new drugs, primarily according to medical need and scientifically established criteria.

Drug Insurance Demands Grow

The demand for insurance against or prepayment of the more consequential costs of out-of-hospital prescription drugs is increasing and will continue to increase, stated J. F. Follmann, Jr., director of information and research, Health Insurance Foundation of America, New York City.

Today, physicians are prescribing more drugs than ever before, Follmann said. As a consequence, the public is spending more money on drugs. However, the proportion of the medical dollar being spent for drugs has remained constant at about 20 percent. Between 1929 and 1956, the prescription volume in drugstores increased 1,000 percent, and the percentage of all drugs sold to hospitals doubled. Between 1948 and 1958, personal expenditures for drugs doubled, and an estimated 67 percent of this amount is spent for prescription drugs.

The increase in expenditures for drugs has been accompanied by an increase in payments for prepaid medical care, Follmann stated. During the period 1948-57, the proportion of the Nation's private medical bill met by voluntary health insurance tripled, and between 1954

and 1959 benefits paid increased 79 percent.

The cost of drugs prescribed in hospitals has long been covered by insurance, but only within the last 10 years has the cost of out-of-hospital drugs been included in major medical expense insurance. Such insurance usually covers all reasonable costs of necessary drugs prescribed by a physician. The amount of this type of protection is growing rapidly, Follmann stated.

According to Follmann, extent of coverage, definition of drugs covered, eligibility requirements, and control measures vary with different plans. Benefits paid for prescription drugs under group major medical insurance vary from 4 to 9 percent of the total expense, depending on economic level, sex, age, nature and amount of deductible provision, and maturity of the insurance plan. Some plans require only that payment be restricted to reasonable costs for necessary drugs prescribed by a physician.

Successful insurance against the cost of out-of-hospital drugs will require that insurers and purchasers of insurance cooperate with physicians and pharmacies, Follmann stated. Such cooperation will confine costs to the reasonable and necessary and yet will assure the physician and the patient freedom of choice of pharmacists and non-interference by insurers with the provision of medical care.

In Follmann's opinion, there is little question that protection against the costs of out-of-hospital prescription drugs will be included in all major medical care insurance in the future. Development of a pattern commensurate with modern standards of medical care and the public demand and willingness to pay for such protection, however, will require experimentation, time, and patience, he said.

Survey Interviews Reveal Medical Care Patterns

Use of the survey interview for collecting data on health and medical care was described by Jerry Solon, Dr. Cecil G. Sheps, Dr. Sid-

ney S. Lee, and Joseph Barbano, all associated with Beth Israel Hospital, Boston. (Dr. Sheps is now at the University of Pittsburgh.)

To identify patterns of obtaining medical care, particularly the use of outpatient clinics in other hospitals, 644 patients attending outpatient clinics at Beth Israel Hospital were interviewed.

The interview technique was designed to minimize any impulse to withhold information about the source of medical care, and the validity of the information was determined by checking the records of Beth Israel Hospital and of the four other hospitals whose use of outpatient clinics was most frequently reported.

The interview information from a subsample of 100 patients was checked. Eight percent had accurately reported using other outpatient departments. Another 3 percent had failed to report their use of other outpatient departments; each of these patients had used a specialty clinic of the same type as the one used at Beth Israel.

Nearly three-fourths of the patients accurately reported the specific clinics they attend. Slightly more than one-fourth failed to name clinics they had used or reported use of clinics they had never visited. Use of clinics at other hospitals was more heavily under-reported than use of Beth Israel clinics.

The information obtained in this study was sufficiently accurate for the objectives of the study and clearly indicated the patterns of medical care among the study population and the place of outpatient facilities in those patterns.

Growing Group Practice Attracts Specialists

The group practice of medicine increased threefold between 1946 and 1959, according to preliminary results reported by Dr. S. David Pomrinse and Dr. Marcus S. Goldstein, of the Division of Public Health Methods, Public Health Service.

In 1946 there were 3,084 full-time and 409 part-time physicians prac-

ticing in 368 medical groups in the United States; in 1959 these numbers had increased to 10,030 full-time and 1,362 part-time physicians in 1,151 groups.

The highest concentration of physicians in group practice is in the Mountain and West North Central Regions, but the most rapid rate of increase has been in the South Atlantic and East South Central Regions. The number of groups has increased, both in metropolitan and rural areas, although the percentage in isolated semirural counties was much lower in 1959 than in 1946.

Among physicians in group practice, the proportion of full specialists is larger (71 percent) and of general practitioners smaller (25 percent) than among other active physicians, 49 percent and 38 percent, respectively. Internal medicine and general surgery are the predominating specialties. As the groups become larger, the number of specialists in each usually increases and the number of general practitioners decreases. Twenty-two percent of the groups were made up of general practitioners only. The mean size of these groups, 3.6 full-time physicians, however, was less than half the mean size of all medical groups, 8.6 physicians.

The principal activity of most of the smaller groups is provision of general medical care. The larger groups provide consultation, as well as referral or diagnostic services, or both.

Few groups reported special programs for older or disabled patients, although a number reported various activities in these fields.

Quality of medical care was maintained through refresher and post-graduate courses, regular staff meetings, and teaching.

Union Efforts Can Increase Medical Care Benefits

Many types of medical care could be prepaid if unions became sufficiently convinced of their importance, according to Agnes W. Brewster, medical economist, Division of Public Health Methods, Public Health Service.

Some advances have been made in the past decade, she said, although collective bargaining has been largely involved in negotiating for increased benefits to keep up with increased costs of medical care, and the amount and kinds of medical expenses not covered by collectively bargained health insurance have not decreased.

However, although only one in four medical benefit plans pays for care of beneficiaries in their homes or in the doctor's office and only one in six offers these benefits to dependents, the scope of medical benefits for organized labor has increased, particularly in the last 5 years, Brewster stated. More workers and their dependents and more retired workers have some medical insurance, cash allowances are larger, the range of fees for surgical procedures has broadened, waiting periods have been reduced or eliminated, and a larger number of plans provide service benefits instead of cash indemnity, Brewster reported.

For obstetrical benefits, the trend is toward lump-sum benefits. Brewster believes that this is partly due to use of cash allowances for maternity hospitalization by service plans and to the failure of most insurance policies to increase lump-sum maternity benefits as maternity costs rise.

Recently unions have sponsored dental clinics, negotiated contracts between health and welfare funds and groups of dentists, and promoted insurance for dental care, Brewster stated.

Except for maternity care, hospitalization benefits are adequate for most union members, Brewster said. Although some plans still provide only 21 days of care, more than half allow at least 70 days, and two in five, 120 days.

The kinds of health insurance available to union members apply to only about 40 percent of the average private expenditure for medical care. Nevertheless, union members and their dependents are better insured than some segments of society, Brewster stated. In 1959 this group, representing 21 percent of the population of the United States, accounted for 27 percent of the

\$5,139 million spent on health insurance, Brewster said. In two-thirds of the collectively bargained plans, the employer paid the entire cost of insurance for the union member and in 45 percent, the entire cost for dependents. Members and employers shared the cost of coverage in one-third of the plans for workers and in 43 percent of those for dependents.

For the population as a whole, only 31 percent of physicians' fees were prepaid in 1959 compared with 58 percent of hospital services. Only 25 percent of the total medical bill was financed through prepayment.

Group Practice Draws 1 of 7 Eligibles

Most group practice prepayment medical care plans have gained members since July 1960, when the Federal Health Benefits Act of 1959 became effective, according to Marie B. Henderson, staff assistant, Bureau of Retirement and Insurance, U.S. Civil Service Commission.

Group practice plans are almost entirely "service" plans, offering a minimum of indemnity features, Henderson stated. They provide extensive preventive and diagnostic services, as well as direct control of the quality, cost, and utilization of medical care.

Recognition by Congress of the value of group practice medical care is an important step forward in the development of these plans, Henderson said. Some of the specific benefits negotiated by the Government in contracts made under the health benefits act have affected the types and extent of benefits offered to other employee groups by group practice prepayment plans.

About 90 percent of all eligible Federal employees are enrolled in an insurance plan, according to preliminary reports from individual carriers, Henderson stated. The majority, 54 percent, chose the Government-wide service benefit plan; 4 percent chose group practice plans. However, Henderson pointed out, the percentage of employees choosing the group practice plans is significant only when it is based on the

number of employees to whom such plans are available.

Henderson reported that, of the 558,600 Federal employees in the nine geographic areas where 13 group practice plans are available, 73,000 or 13.1 percent, enrolled in this type of plan. This is nearly double the number enrolled before the 1959 act became effective. No group practice plans are available to Federal employees serving outside the United States, she said.

GHI Explores Insurance For Psychiatric Care

To determine the feasibility of including psychiatric care among the services available to subscribers to group insurance plans, Group Health Insurance, Inc., is conducting a 2-year research project in the New York City area. Arthur H. Harlow, Jr., its president, reported the first year's experience.

Emphasis on the value of psychiatric services is increasing, and forward strides have been made in the effectiveness of short-term therapy, Harlow noted. Many psychiatrists believe that in many cases effective treatment of a psychiatric condition would lower the demand for medical and surgical care to an extent that the decrease in other claims would more than offset the cost of psychiatric care. "It is our hope to secure information which might either confirm or deny this contention," he said.

The greatest single problem in determining insurability is the difference in utilization of psychiatric services by different groups, Harlow stated. In the research project, some "white collar" groups, principally professional workers and their families, used psychiatric services at a rate five or six times the average, whereas "blue collar" groups used the services but slightly. Perhaps the information given these employees by personnel directors and officers of unions affects their readiness to seek psychiatric treatment, Harlow suggested.

The psychiatrists estimated that for 53 percent of the patients, the project was a major influence in

their seeking treatment. Harlow reported that 57 percent of the patients had had no previous treatment; 40 percent were referred by physicians.

The psychiatrist recommended further treatment for 95 percent of the patients who completed all office visits available to them; 68 percent of these continued treatment at their own expense. About half the patients averaged about one-third of the visits to which they were entitled. The principal reasons given for discontinuing treatment were recovery or improvement, resistance to treatment, and transfer elsewhere for therapy.

It is Harlow's belief that before insurance for psychotherapy can be undertaken with confidence, a great deal more medical and statistical information will be needed. The data obtained by the research project will, he hopes, mean substantial progress toward making psychiatric treatment socially acceptable and financially possible for families of average means.

Maryland Progressive Care Unifies Health Services

The development of facilities and services that will lighten the load of general hospitals is a real challenge to public health, declared Dr. Perry F. Prather, director, Maryland State Department of Health, Baltimore. With the continuing rise in per diem costs of hospital care, he urged public health workers to take the lead in cooperating in this process with government and voluntary agencies and professional groups.

Maryland's "progressive care" program for indigent and medically indigent residents combines complementary activities in one State-administered program. The integrated programs provide home, office, and local health services and care in both general and chronic disease hospitals, Prather stated. Progressive care permits patients to be transferred from one facility to another as their needs change. The health department assists hospitals in placing patients who no longer need inpatient care, he said.

The contemplated provision of additional nursing home beds will aid health and hospital personnel in effecting proper placement and will increase the number of available beds in both general and chronic disease hospitals.

The outpatient program makes diagnostic service available to patients on an ambulatory basis, and followup service makes possible earlier discharge from the hospital, Prather stated. Local home care programs are gradually developing through inclusion of more bedside nursing and homemaker services in the medical care program.

Since 1957 all persons "suffering from a chronic disability amenable to rehabilitation" have been eligible for care in chronic disease hospitals, regardless of income. A graded payment plan, based on the patient's ability to pay, ranges from no charge to full charge. In no instance does the payment required exceed the cost to the hospital, Prather said.

The trend of local health services is toward supporting and maintaining the patient in his home community rather than in institutions, Prather concluded. Therefore, in his opinion, hospitals and other institutions should work toward returning the patient to his home, and the community should develop services that will promote early discharge from the hospital. Public and private agencies "should act as 'catalysts' to promote a high degree of community action," he stated.

Referrals by Optometrists Number 800,000 Plus

The skill and understanding of the optometrist in differentiating between conditions coming within his field and those belonging to other professions play a large part in the maintenance of the health of his patients, stated Dr. Galen F. Kintner, optometrist, Lynden, Wash.

Many persons with vague symptoms consult an optometrist, Kintner said, and their symptoms of visual disorders are similar to those of general disease and of dental or eye health conditions. The optometrist must decide whether the condition

is within his province or whether the patient should be referred first to a general practitioner or a specialist.

According to Kintner, the optometrist refers patients who require medical or surgical treatment of the eyes to ophthalmologists and those in need of medical or dental care to physicians or dentists. He not only encourages the patient to seek the services of specialists but he gets in touch with the consultant chosen by the patient. If the situation is acute, he may even accompany the patient and confer with the physician on the signs and symptoms that prompted the referral.

The American Optometric Association made a study of referrals by optometrists to members of other health specialties, Kintner said. Replies to a questionnaire sent to a random sample of 1,350 of the estimated 18,500 optometrists in active practice in the United States indicated that 818,360 patients are referred by optometrists annually. Fifty-four percent are referred to ophthalmologists, 33 percent to general medical practitioners, 3 percent to dentists, and 5 percent to other optometrists.

The number of referrals to his colleagues increases with the optometrist's age and the number of years he has been in practice, Kintner reported. This reflects the increasing age of his patients with his own increasing years, and the health problems that accompany age.

A study is needed of a more representative group of optometrists, Kintner suggested. Such a study should include a search for information on screening methods and procedures for determining deviation in normal eye function, study of communication between optometrists and members of other professions, and an effort to improve techniques of communication.

Tarheels Improve Outpatient Care

The quality of medical care in an outpatient clinic may be measured by the clinic's records, according to Dr. Robert R. Huntley, Rahel Stein-

hauser, Dr. Kerr L. White, Dr. T. Franklin Williams, and Dr. Dan A. Martin, University of North Carolina School of Medicine, Chapel Hill.

Huntley and his colleagues described the evolution of quality control procedures in the general clinic of the North Carolina Memorial Hospital, where outpatient records have been examined in weekly chart conferences since 1953. They also analyzed the quality control data from two random samples of case workups by medical students during the spring semesters of 1959 and 1960.

An earlier pilot study had suggested that routine clinical and laboratory procedures either were not always performed or were not utilized to assure a complete evaluation of the patient's medical problems, and that the weekly outpatient chart conference was not always detecting and correcting chart deficiencies.

After chart conference procedure was reorganized in 1960, data from 240 charts for the 1960 spring semester were compared with similar data from 240 charts for 1959. The revised chart conference is as follows: With the help of a record librarian an "activities card," containing essential data, is initiated for each chart and attached to it. A physician then reviews each chart, evaluates the adequacy of the workup, and notes any deficiencies. All charts with unexplained deficiencies are returned to the responsible student or physician for completion and are recalled to chart conference later.

Since initiation of the "activities card," there has been a decrease in the number of abnormalities not followed up. All students improved their performance but students in the upper third of their classes made the greatest improvement. Among the preceptor groups, the resident and fellow preceptors seemed to require more thorough followup by their students, with more attention to detail in obtaining and recording clinical data.

Huntley and his co-workers anticipate that the data from the "activities card" may help in monitoring the effectiveness of specific teaching exercises and that further efforts in

quality control will develop indices of the quality of medical care which will be useful in monitoring all the teaching and service activities of the clinic.

Electronic Nurse Charts Pulse Rates and Fevers

New tools and techniques are urgently needed to increase the capacity and speed of operation of the Nation's health facilities, according to Dr. James Hillier, vice president, RCA Laboratories, Princeton, N.J. Modern technology can provide many of these, Hillier said, but the cost of engineering is often prohibitive.

Many devices that have been applied to medical and health needs remain at the prototype or limited-production stage, Hillier said. Only a small percentage are economically engineered and available in quantity.

An added factor in the cost of electronic devices is the special training required for their users. The electronic stethoscope, for example, because it presents a new type of information, should be introduced first to medical students. To the older physician it speaks an unfamiliar language, and to use it he must throw away the lifetime of experience that makes his old stethoscope valuable.

Some devices and techniques, such as X-ray fluoroscopy and cardiography, have become standardized. Hillier noted, but many promising ones remain to be developed into a standardized form. Among these are X-ray image intensifiers, automatic high-speed techniques for measuring and counting blood cells and other particles viewed through a light microscope, electronic stethoscopes, pulse takers and thermometers, electronic sensors, and a "radio pill" containing a miniature transmitter that broadcasts information about conditions within the digestive tract.

Hillier said that some of these devices measure temperature, pulse, muscular action, and digestion and report the results by wireless radio transmission. This suggests their

Medical Assistance Abroad

The United States must step up its export of "human capital" in order to surpass the Soviet Union in the struggle for the allegiance of uncommitted peoples of Asia, Africa, and Latin America, Adlai Stevenson said at the 15th annual Albert Lasker Awards presentation of the American Public Health Association.

He urged that top priority be given to the sharing of American doctors and health skills with backward nations beset by disease and poverty. The United States is lagging in its export of this "capital," he continued, because of a doctor shortage at home. Success in attaining improved medical care and services in this country will enable us also to fulfill our responsibilities abroad.

Stevenson proposed a four-point program for overseas medical assistance and increased health protection for all Americans:

Federal aid to permit construction of new medical schools which would train the additional physicians urgently needed in the United States.

An increase in United States medical research against heart diseases, cancer, and mental illnesses, in keeping with the growing threat of these diseases throughout the world.

Financing comprehensive medical care for old Americans through the social security system.

Expansion of United States aid to health projects throughout the world, in cooperation with the United Nations and other overseas agencies.

practical use in caring for hospital patients. In an electronically equipped hospital, each patient might wear measuring units built into bracelets or pendants for transmitting information to a receiver for relay to a central display board on each floor. The system might also call to the nurses' attention any unusual change or dangerous condition in a patient.

Everything in this system is technically feasible, Hillier said, but in many cases the market is too limited to justify the engineering and manufacturing costs. Even if every hospital in the country were to invest in such equipment, the potential market would be only a few hundred or a few thousand units.

Solving this complex problem is not simple, Hillier stated. Professional organizations have suggested the establishment of regional engineering centers financed on a non-profit basis. These centers, in cooperation with doctors, hospitals,

and other private agencies, would develop and introduce into use new devices and techniques, he concluded.

Medical Education Promotes International Understanding

One of the best bridges between two widely divergent cultures is the medical field, declared Dr. Francis Scott Smyth, coordinator, Airlangga University Project, University of California School of Medicine, San Francisco. This has been demonstrated by the experience of the University of California in Indonesia, he reported.

In 1954, in response to an invitation by the University of Indonesia and the Indonesian Government, the University of California established an educational program for medical students, providing faculty and teaching aids to the University of Indonesia at Djakarta.

Before the university accepted the invitation of the Indonesian Government, Smyth visited Indonesia. Reporting on this visit, he said, "In my first reaction to the realities of overpopulation, ignorance, disease—cultural shock—I suggested to the faculty that they develop a substandard profession—high school graduates trained in nutrition, sanitation, inoculation. I was politely informed that they had tried such a scheme—the *mantri*. But that when these male nurses went to teach the use of latrines or smallpox vaccination, the villagers would listen only after their acutely ill—the lame, the halt, and the blind—had been treated. As a result the *mantri* were given simple therapeutics and became third-rate practitioners! 'No,' said the faculty, 'we did not ask you, Dr. Smyth, to establish a school of public health. Our experience convinces us that the historical pattern must be followed; that is, we must first have an able profession in the healing art before we can develop a sound preventive, public health program.'"

The ideal American appointee is one who is enthusiastic and well versed in his field and who respects people, their customs, and their religion, Smyth said. He is not too satisfied with the status quo but he is not too eager a reformist. The best measure of his effectiveness is his ability to train future doctors and potential successors from among his students. Appointees serve 2 years, aiding in teaching and administration at the University of Indonesia. Some serve as consultants; others replace Indonesians who are coming to the United States for advanced study. Some must assume full responsibility for developing new departments, while others instruct laboratory technicians, introduce new methods, and provide technical service.

Research funds are administered by a research committee. Dollar funds for foreign-purchased aid and instruments are handled by the University of California, and purchases are made through the university's purchasing department; rupiah donations are handled in Djakarta. The coordinator's office in San

Francisco processes all American personnel, using University of California salary scales and status prerequisites. Indonesian students selected jointly by the United States field staff and the faculty of the University of Indonesia are placed from this office, some at the University of California and some at other universities, to study under former members of the project field staff.

The strong department of preventive medicine and public health which has been established in Indonesia may prove to be the nucleus of an independent school of public health, Smyth stated. Already the Indonesian Government, which requires 2 years of military or health services from students whom it subsidizes, has allowed 30 percent of the graduates of the medical program to teach at the medical school.

With the shortage of doctors and basic science teachers in the United States, it is difficult for American universities to release faculty members for a 2-year tour of duty abroad. Nevertheless, continued support for a visiting professorship in Djakarta and for trainees for future faculty and investigators is urgently needed. "I should like to plead for long-term support of such affiliations," Smyth concluded.

Medical Care Trends Revise Education

Medical education today was measured against the changing trends in medical care by Dr. E. Richard Weinerman, medical director, Herick Memorial Hospital Clinics, Berkeley, Calif.

In California, changing demographic and socioeconomic conditions have created new challenges for the medical planner and public health educator, Weinerman said. The State's rapidly growing, mobile, urban, aging population requires additional medical personnel, hospital facilities, and public health services. Modern industrial hazards and a large migrant population call for medical graduates who are

trained and equipped to deal with these problems.

Today those who plan curriculums for medical schools are faced with changing patterns of utilization of physicians' services. Two-thirds of all medical visits are to chronically ill patients, and more time is spent on the services of medical teams. Less than 10 percent of all medical visits are for preventive or health maintenance services, Weinerman stated.

Medical schools must prepare their graduates to face "a bewildering complex" of special facilities, special staffs, insurance plans, private services, and cash allowances, all with variations in financing methods, coverage, services, and methods, Weinerman said.

The increased number of prepaid medical care plans has enabled more people to pay for medical services, Weinerman stated, and this has had a far-reaching effect on the private practice of medicine. In his opinion, this may be a blessing in disguise since, with fewer service cases available, teaching standards are being applied in private wards.

Medical curriculums of the future must be planned to produce physicians who are skilled in the organization of modern technical resources as well as in their use, Weinerman concluded. These physicians must recognize the vital part played by the nonmedical members of the health team. They should be familiar with all aspects of medical care programs and be prepared to carry on research in environmental medicine, and they should appreciate the need for application of the full capacity of medical services to the health needs of the people, he said.

Medical Care for All Seen Imminent

Unmet medical needs in the farm country far outnumber those in urban areas, stated James G. Patton, president, National Farmers Union, Denver, Colo. In rural areas, incomes are smaller, populations are scattered, physician-population ratios are lower, hospitals are fewer and less well equipped, and the kinds

and quality of public health services do not approach those available in urban areas, Patton said.

However, he continued, for the first time in history we can look forward to the time when "no citizen need forgo medical care, no matter what his financial means at the time of illness."

Stating the case for national prepaid health insurance, Patton said that only through social security "can the risk of illness be spread over virtually the whole population."

In his opinion, a prepaid medical care program is the only way to provide for health and medical needs, especially those of senior citizens. The insurance prepayment principle in the organization of medical care programs assures such care, Patton said.

A national medical care program will require research and education programs on cancer, heart disease, and multiple sclerosis, and control of communicable diseases, including poliomyelitis, Patton concluded.

be given dignified appraisal, if for no other reason than it gives free rein to, in Sir Arthur Newsholme's phrase, "the driving power of mercy." In the past century the lay social reformer was a militant forerunner of the professional public health worker in pressing for major improvements, often unsupported by scientific evidence and, on important occasions, contrary to such evidence. The failures were a meager price to pay for the successes, Wolman maintained.

"There is something to be said for a public policy which demands clean air, clean streams, and decent houses per se, even if the coefficients of correlation with morbidity and mortality are either nonexistent or of a low order of magnitude."

After all, he said, we cannot measure the physiological-psychological merits of green grass and trees. Yet Sir Arthur Mudaliar of India at the Eleventh World Health Assembly wisely bemoaned the fact that no health officer included in his official agenda an interest or an influence in preserving or creating open spaces in the rapidly urbanizing areas of the world. He suggested that engineers who plow under vast green areas for the super-highway and who pile brick upon brick in urban and suburban areas may be as subtly destructive in their way as was Typhoid Mary.

The final route, the integration of disciplines to center their efforts on the environment, is as yet almost completely untried, he maintained. The task of curbing the vicissitudes of a changing environment is not the exclusive jurisdiction for understanding or abatement of any single professional group. The engineer has the age-old obligation of translating concept into structure and facilities, but he must move forward simultaneously with the physiologist, chemist, physicist, biochemist, and other scientific workers. Such an integrated effort must come within the compass of the specialist's thinking, Wolman emphasized, even if the opportunities for such a broad approach may be limited to only a few departments of health.

No one should underestimate the difficulties of interdisciplinary inte-

Environmental Health . . .

Six Choices To Combat Environmental Stress

Choices among six policies for public health workers facing demands that they combat environmental stresses were offered by Dr. Abel Wolman, professor of sanitary engineering, emeritus, Johns Hopkins University School of Hygiene and Public Health, Baltimore, Md.

He itemized for debate the several routes open when the man on the street and the social reformer demand action to control the objectionable atmosphere, the unsightly stream, the mysterious tastes and odors of water and food, and the apprehended effects of radiation. In such instances, abstract explanations of the inadequacies of scientific knowledge, of epidemiologically unexplored worlds, and of insufficient data fall on deaf ears, Wolman declared.

The Madison Avenue or propaganda route is the easy one, Wolman explained, because the changing environment has many features that lend themselves to the soft sell. "The use of suggestion as a mask for scientific ignorance and of implication as a substitute for epidemiological evidence are great temptations for bolstering the budget, for focusing public attention, and for providing action even if ill-defined," he continued. The health officer undoubtedly looks on this choice with a jaundiced eye, fearing a boomer-

ang from false projections. Examples of such discredited efforts are all too numerous, he said.

In describing the statistical route, Wolman felt that the biometrician's tools are eminently useful in providing some underpinning for public health action, and that this route was useful in the search for policy support.

In discussing the use of epidemiology, Wolman declared that it was unfortunate that in the past the epidemiologist has not put more investigative effort into environmental forces. "The dependence of the health officer upon wider epidemiological inquiry into the subtle impact of the environment upon man is so great that the investigator should increasingly apply his tools to such areas as the impact of air pollution upon respiratory disease, of minor concentrations of chemical constituents in food and water upon long-term disease, and of the whole virus complex in its relation to environmental routes for disease causation."

The way of experimental research is slow, uncertain, and difficult of formulation, but as a prime ingredient of ultimate intelligent policy and action, it perhaps takes first place. "Action will obviously proceed while the haven of new scientific discovery, perennially, and, it is hoped, promptly, adjusts day-by-day practice," said Wolman.

Wolman advocated that the route of intuition in public health practice

gration. That such relationships can be successfully maintained under wise direction is already being demonstrated in a number of public health areas, such as chronic disease, mental hygiene, and environmental control activities, in many places in the United States. Skill increasingly is acquired where motivation is strong.

Would Judge Chemicals With Other Hazards

A systematic and thoughtful evaluation of the potentially toxic chemicals that are being manufactured, used, and deposited in the environment was called for by M. Allen Pond, Office of the Secretary, Department of Health, Education, and Welfare.

Cautioning that the chemical hazards are only one component of many factors in health, he cited a Food and Drug Administration estimate that there are approximately 300,000 products found in the home (polishes, bleaches, cleaners, paint removers) which may contain ingredients that are poisonous or dangerous if swallowed, inhaled, or even touched. In addition, 1 million tons of agricultural chemicals, exclusive of fertilizers, are used annually in the United States: these present potential hazards to the farmer and may also affect farm products. A special challenge is presented by agricultural chemicals which, after leaching into ground water, appear in drinking supplies.

Pond also noted that 400 to 500 new chemicals of all types are introduced for common use each year. The poisonous properties of many often are unsuspected until casualties occur. Threats to public health also stem from the behavioral effects of psychopharmacological compounds, such as barbiturates and amphetamines, used without medical supervision. These may contribute to highway accidents or other tragedies.

Bootleg drugs which counterfeit bona fide products are a chemical hazard, he said, in the sense that they may fail to produce expected effects or may contain damaging sub-

stances. These are now the object of a national law enforcement drive.

Substantial hazards may also develop in the manufacturing, packaging, and distribution of chemicals and in the disposal of wastes from plants in which the toxic substances are manufactured or used, Pond added. Many cannot be measured in nature, are difficult to identify, and are not affected by existing waste treatment processes.

Despite this mounting threat from potentially toxic materials, there is an increasing gap in our knowledge of the impact of these chemicals on the health of man and of techniques for controlling them, Pond declared. The vast number of new chemicals has intensified the task of developing simple, inexpensive, accurate, and quick tests for identification. Until the substances can be identified, effective control is impossible.

Complicating control efforts is the fact that some hazards are immediate and actual and others are long range and potential. Little is known about lifetime exposures to minute quantities of various chemicals or the synergistic effects when two or more compounds of low toxicity combine in nature or within the body.

Intense economic repercussions may be produced by a challenge to hazardous chemicals, he said, because of their importance in manufacturing and in agriculture. Therefore, the potential hazards will probably be evaluated as calculated risks, Pond predicted.

In the past, government has assumed responsibility for control of chemicals in the environment. The Food Additives Amendment and the Color Additives Amendment to the Federal Food, Drug, and Cosmetic Act and the Federal Hazardous Substances Labeling Act are examples of what society is willing to do to provide a safe and healthful environment while preserving reasonable opportunity to utilize chemical substances that have utilitarian or esthetic values.

Pond listed the following reasons why government will probably play an even greater role in controlling chemical hazards: evaluation and

control of the risk are beyond the capabilities of the individual; the task cannot be delegated entirely to groups that have a vested economic interest; and the multiplicity of sources of exposure preclude a single producer from evaluating the total impact and being solely responsible for controlling the risk.

He added that caution must be exercised to avoid an unwarranted undermining of the public's confidence in the safety of the environment, while informing the public of the essential facts as they become known. Balancing economic benefits with health risks growing out of the use of chemicals in our society involves so many questions of public policy that future action will require consideration at every level of government, by the public, the health professions, and the regulatory agencies, he said.

It is not too much to hope that we will consider the threat of chemical hazards in context with the equally important physical, biological, and social threats to health, he declared.

Germfree Colonies Yield Clues to Sanitation

Techniques devised for germfree animal colonies have great potentialities in the control of the environment, stated John L. S. Hickey, chief, Germfree Services Section, National Institutes of Health, Public Health Service, Bethesda, Md.

He cited examples of research accomplished with these "living test tubes." Germfree animals were used to prove that bacteria do cause dental caries, and that calculus formation on the teeth is not necessarily caused by bacteria. Germfree guinea pigs did not contract amebiasis when inoculated with a pure culture of *Entamoeba histolytica*, but only when certain enteric bacteria were also present. Experiments with these animals may help to hasten control or eradication of the puzzling mechanism of this disease, he said.

Germfree animals, or gnotobiotics, have also been used extensively in studies on nutrition and radiation sickness, he continued. Until

recently their potentialities in testing the sterility of vaccines, in determining the function of the virus in cancer, and in many other fields of research were largely unexplored. The germfree animal provides a unique method for studying the relationship between the host and the contaminant.

Difficulties with diet and the expense of protective equipment were responsible for the small supply of such animals for many years. Hickey described the types of apparatus currently used and some of the devices produced at the National Institutes of Health. The metal chamber for individual laboratories developed by sanitary engineers in collaboration with research investigators has been used continuously without contamination for more than 2 years (see illustration). The large plastic chamber developed by Trexler at Notre Dame has a half-man jacket instead of a simple glove for handling the animals. Being investigated are the suitability of this unit and necessary modifications for its use in a large-scale germfree animal-breeding facility being planned at the Institutes.

Hickey noted that flexible plastics are particularly valuable because the material can be worked and formed in the laboratory, features attractive to scientists with "do-it-yourself"

tendencies. Levenson and Trexler are currently studying the potentialities of a large flexible plastic isolator to maintain a germfree atmosphere during surgery.

Plastic equipment is now sterilized with peracetic acid, but because of its corrosive and explosive properties, the sanitary engineering staff is developing procedures to sterilize with ethylene oxide gas, Hickey said. This agent has long been used at the National Institutes of Health to sterilize books, toys, telephones, and oxygen tents from infectious disease wards.

Food for germfree animals is normally sterilized by steam, but because of heat's destructive effect on vitamins and other nutrients, other methods have been sought. In some studies at NIH, the diet is packaged in hermetically sealed plastic envelopes no thicker than 1 centimeter and irradiated with a 3-million-volt Van de Graaff electron beam accelerator. Monitoring and remote control of the process is done with a television camera. To insure complete sterilization, paper strips containing bacterial spores are placed under the packets during irradiation and the strips are cultured, incubated, and checked for absence of bacterial growth before the animals receive the food. Another solution, raising germfree plants as diet additives for the ani-

mals, is also being tried at the Institutes, Hickey said.

Sanitary engineering support of germfree research has two objectives, he declared. The first is the improvement of equipment and technology so that the scientist can spend maximum time and effort on research and the minimum time caring for the animals and maintaining the germfree state. The second objective is applying the techniques learned to other areas of environmental control. For example, bone segments excised from patients and heat-sensitive surgical apparatus are being radiation-sterilized by the method devised for the animal diets. And germfree technology is contributing to the development of the mass production of laboratory animals that are free of specific pathogens.

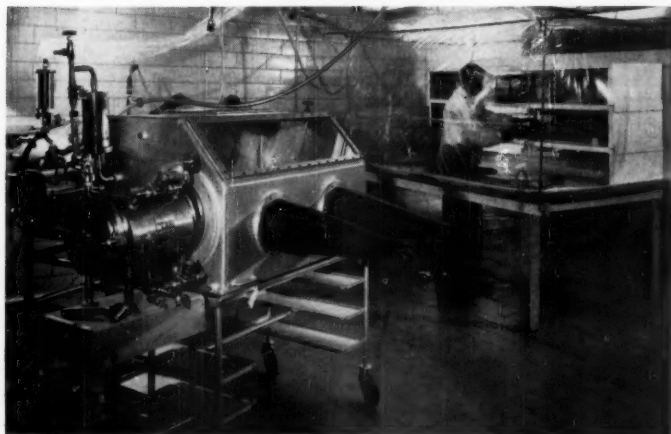
Pennsylvania's Sanitarians Spur Community Action

To improve environmental sanitation Pennsylvania's sanitarians have switched from inspections of establishments or situations to a community-oriented approach, reported Karl M. Mason, director, bureau of environmental health, and Harry Steigman, director, division of sanitation, Pennsylvania Department of Health, Harrisburg.

Since 1959, State sanitarians have successfully started 40 community projects at borough, township, city or county level, involving from 1 to 71 municipalities. The community approach is being tried, the authors said, because the State must provide environmental health services for some 7 million people not served by local health departments.

They outlined the procedures the Pennsylvania sanitarians follow. At the start of a project the field sanitarian prepares a plan that contains an evaluation of the nature and significance of the community's sanitation problems, objectives of the proposed project, and methods necessary to accomplish it. This plan is reviewed by his supervisor.

The field sanitarians are concerned with small water supplies, subsurface sewage disposal facilities, food and drink establishments,



Left, metal chamber designed for use in individual laboratories; right, large plastic isolator with half-man jacket being prepared to receive germfree animals

solid wastes, and vectors. However, the authors explained, since the division of sanitation is part of the State's bureau of environmental health, the sanitarians often serve as coordinators for other activities involving public water supplies, sewage or industrial waste treatment, air pollution, and the hygiene of housing.

Because little is done about the reports of many community surveys, Mason and Steigman said, the Pennsylvania sanitarians employ a conventional plan of action, as follows:

1. Obtain the assistance of key individuals in the community to gain support for the project before seeking a final agreement on details.

2. Close an agreement with community officials for the State health department to conduct the survey.

3. Recruit local official agencies to help conduct the survey, so that they are prepared to assist in supporting the recommendations.

4. Form a citizens advisory committee to assist in developing the means to execute the recommendations.

5. Prepare the advisory committee, supported by community organizations, to assist community officials in obtaining passage and enforcement of any necessary legislation.

6. Publish the report of the survey and distribute it widely so that the citizens committee can organize for joint action with the appropriate government officials.

An evaluation of the effects of the community-oriented approach is not yet possible, the authors explained, since about 2 years are required to complete most projects.

As the key person in this approach, the sanitarian must be a positive person, prepared to act as adviser, consultant, educator, psychologist, social and political scientist, and enforcement officer. New sanitarians are prepared for this many-faceted role, the authors said, by training in such specific areas as technical competence, group dynamics, and the power structure and organization of the community. The training needs of experienced field staff members are determined indi-

vidually, and supervisory and administrative personnel receive advanced training.

Industry Noise Control Conserves Hearing

In 1946 a Subcommittee on Noise in Industry was set up which was concerned with the establishment of routine pre-employment audiograms and followup hearing tests, reduction of noise at the source, use of ear protectors, and research.

The group issued two publications, one a statement of the most important facts relative to noise-induced hearing loss, the other an outline of procedures for creation of a program on the conservation of hearing. The findings of this subcommittee, revised and combined in 1957 as a "Guide for Conservation of Hearing in Noise," are as pertinent today, as when first released, asserted Dr. Aram Glorig, director of research of the Subcommittee on Noise Research Center, Los Angeles, Calif.

It was ascertained that hearing loss caused by loud noise is due to damage of the inner ear where the hearing nerve terminates and that such damage is permanent. More impairment is caused by high-pitched than low-pitched tones and can be reduced by lowering sound levels. Sound conditioning of walls and machines does not decrease the volume of noise to a safe level nor does cotton in the ears provide adequate protection, but properly worn ear protectors minimize most noises to a safe level. It also has been found that the ears of some men are more easily injured by noise than the ears of others.

Response to the original reports was slow. Because of the expense and fear that the introduction of a conservation of hearing program would enhance the possibility of compensation for hearing loss, industrial leaders for the most part let well enough alone.

But New York State, in a decision by its Court of Appeals in 1948 (*Slawinski vs. J. H. Williams and Co.*), recognized hearing loss due to industrial noise as an occupational disease and compensable without

loss of earnings. A deluge of claims followed, with some officials estimating the potential accrued liability in the United States at billions of dollars.

Medico-legal methods of reporting the percentage of hearing impairment were reviewed in 1950 by a joint committee from the American Medical Association and the American Academy of Ophthalmology and Otolaryngology. Its conclusions, "Guide for Evaluation of Hearing Impairment," were published in 1959.

Continuous research on noise is conducted in the laboratory and in the field by the research center, according to its director. Many industrial organizations are now co-operating with the Subcommittee on Noise. Through annual examinations in plants where noise levels remain constant and there is little personnel turnover, data on many employees are available and valuable information is accumulating. A curriculum for training of nurses and technicians in industrial audiometry has been established and courses are given when warranted. Many professional people including jurists, lawyers, industrialists, engineers, acousticians, biologists, physicists, industrial hygienists, insurance executives, and physicians are concerned with noise in industry and its many ramifications, Glorig continued.

There are so many individual responses to a given noise that damage risk criteria, correction factors for nonoccupational hearing loss accompanying age, or rating scales for establishing compensation cannot be set up to fit all cases. For that reason, standards are determined from average rather than individual response.

Many individual companies will not, even now, organize hearing conservation programs because of the old fear of compensation claims, Glorig said, even though experience has shown employees respond favorably to reasonable efforts to protect their health. It has been demonstrated that companies with active programs face fewer claims for compensation, Glorig pointed out.

A factual approach to the evalua-

tion of hearing impairment and compensation aspects of the issue, the introduction of hearing conservation programs, and cooperation between employer and employee can keep the stresses of noise within reasonable limits, Glorig concluded.

Public Values Clean Air If Government Leads

A steady stream of complaints to the air pollution control agency is the sign of a healthy public attitude, declared Irving Michelson, director of public service projects, Consumers Union, Mount Vernon, N.Y.

Michelson quoted the superintendent of a bureau of air pollution control in a city which has won several "cleanest city" awards. "The cleaner you get a city, the more complaints you receive. The people in this city know they do not have to put up with smoke, dust, or odors, and they complain about the least things."

Michelson gave several reasons for public indifference to polluted air in many localities. People have grown accustomed to soot and are unaware that conditions can be improved. People refrain from making complaints because they do not want to be known as cranks. And frequently they don't know that a control agency exists or how complaints can be directed.

For example, he said, the air pollution control agency may be in the department of public safety, the department of buildings, department of public works, department of building inspection, or department of engineering. In one city the responsibility for control is divided between the county department of smoke regulation, which investigates complaints resulting from combustion, and the city department of health, which investigates emissions of fumes, odors, gases, lint, and mist from noncombustion sources.

Michelson urged public health officials to inform the public of the facts about air pollution in their cities, the existence of control agencies, and the results that can be achieved. He advocated more local testing to help overcome the lag in

knowledge of atmospheric pollutants.

Consumers Union, he said, received wholehearted public support when it conducted an intensive study of pollutants in the Ohio River Valley. "When equipment was set up in six towns we were besieged with requests to extend our studies to other communities, and three more towns were included." A further study by CU, he predicted, would provide more ammunition for proponents of control because it will probably demonstrate that the inhabitants of a city individually can save money by investing a small sum in a municipal or regional air pollution control agency.

Nursing Home Managers Need Environmental Aid

Wider dissemination of existing knowledge of environmental requirements of nursing homes was urged by Dr. Bruce Underwood, chief, Nursing Home Services Section, Public Health Service.

We know a great deal about accident and fire prevention, safe construction, proper care of buildings, sanitation, and adequate equipment, but generally, nursing home personnel do not benefit from this information or even know it exists, he declared. They would welcome practical, simple, educational publications of a "how to do it" nature.

The homes vary so greatly by type, geographic location, operational auspices, and financial support that it is difficult to prepare one set of materials that would be useful to all homes. However, the need for technical information is so great that even a list of reading matter on various subjects would be hailed as a major contribution.

Improving the nursing home environment will also require consultative and technical assistance, Underwood said. It would take nursing home personnel years of on-the-job experience to learn what a technician, giving assistance in depth, can teach in a short time by example and demonstration.

In discussing the regulatory approach to improvements, he suggested that local communities

should be encouraged to establish standards in excess of minimums adopted at the State level. He mentioned the National Nursing Home Standards Guide now being developed as an aid to regulatory agencies and other groups in developing and improving standards. The publication will include chapters on physical facilities as well as the establishment, maintenance, and operation of homes.

Environmental health in nursing homes is a broad subject which encompasses site selection; building structure, requirements for corridors, exits, stairways, and ramps, and electric, water, sewerage, and heating facilities. But an atmosphere of consideration, understanding, and sympathy for the residents and all those engaged in patient care in nursing homes is also essential, Underwood declared.

Essentials for Planning State Radiation Lab

The design of California's new State radiological laboratory was described by Arnold E. Greenberg, chief, sanitation and radiation laboratory, California State Department of Public Health.

He pointed out that although the Federal Government has undertaken the major burden of control and surveillance of environmental radioactivity, an amendment to the Atomic Energy Act in 1959 has made it possible for the States to assume some of these responsibilities. He warned that if responsibilities for control of the increasing use of radioisotopes and radioactive materials are not to overwhelm health departments, program planning and execution should begin now.

The task of a radiation safety program, Greenberg said, is to determine the exposure of the human population through analysis of samples of air, precipitation, water, soil, vegetation, sewage, and foodstuffs and to evaluate the probable biological significance of point sources of radioactivity. The California laboratory has a capacity for the analysis of 7,000 samples annually with a total of 16,000 deter-

minations of differing degrees of complexity. To establish and staff the laboratory adequately for the first year cost approximately \$188,000. He emphasized, however, that the laboratory should be tailored to fit the current radiation safety program of the State. In many instances, only gross alpha or beta counting is needed, and such capability can be added to an existing laboratory for less than \$2,000.

Greenberg listed the equipment in the California laboratory: windowless gas-flow proportional counters to measure gross alpha or beta activities (four manual systems and one fully automatic one with a combined capacity of more than 2,000, 30-minute counts per month); an automatic low-background Geiger-Müller detector assembly to measure strontium-90 emissions which can count about 300 samples per month; a single-channel gamma analyzer and well-crystal scintillation detector to measure separated single gamma emitters such as iodine-131; a 256-channel analyzer with a massive 6-ton steel shield and a 4-inch by 4-inch scintillating crystal to analyze complex mixtures of unknown gamma emitters, and a 5-cubic foot muffle furnace to prepare 10-pound samples of food for strontium-90 measurements.

To maintain the equipment it was decided that the laboratory should have its own electronics shop, Greenberg stated. Although service items individually are not costly, tube and resistor testers, voltmeters, spare parts, and tools so far have cost about \$2,000. The total cost for original equipment was \$63,000.

The laboratory's 2,000 square feet of floor space is divided into a counting room and electronics shop, a sample preparation room, and four conventional wet chemistry laboratories with sufficient space for two chemists in each laboratory. The facility is in a prefabricated steel building reasonably free from excessive interference by background counting rates.

He listed other special needs of the physical plant: sufficient electrical circuits and outlets in the counting room; adequate ventilation in the sample preparation room

to dissipate excessive heat and moisture caused by drying and ashing operations and an afterburner to eliminate offensive odors when biological materials are burned; and at least 5 feet of hood space per chemist in the chemistry laboratories because of the large quantities of fuming nitric acid required in separating strontium. Total cost for the space, newly constructed or rearranged and equipped with benches, hoods, and other necessary furnishings, was \$42,000, Greenberg said.

A competent and adequately trained staff is the most important requirement for such a laboratory, he declared. The California laboratory budgeted for a staff of eight chemists, one instrument technician, three laboratory assistants, and two clerks. Because experienced radiochemists are extremely scarce, it was decided to fill two key positions, a radiochemist who would supervise the laboratory and the instrument technician who would operate as well as

maintain the more complex devices, with specially qualified people and hire analytical chemists with little or no radiochemical experience for the remaining positions.

Qualified persons were recruited from industry to fill the two key posts, he said. For the others, inservice training consisted of a course in nuclear chemistry and a course in basic radiological health for each chemist and, for selected chemists, courses in radionuclides in food, radioactive pollutants in water, radionuclides in water, and radioactive pollutants in air.

Courses at the Sanitary Engineering Center, Public Health Service, contributed substantially to the success of the inservice training, Greenberg said. Staff members also received training at the University of California and through courses conducted by equipment manufacturers. Personnel costs for the 1960-61 fiscal year are estimated at \$83,000.

Water and Wastes . . .

Deplore Complacent Water Management

A large percentage of the water supplies of interstate carriers, including the largest and best operated, neither meet coliform standards of the Public Health Service consistently nor are they examined in an adequate number of samples.

These facts were brought out by Omar C. Hopkins, deputy chief of the Division of Water Supply and Pollution Control, and Floyd B. Taylor, chief of Water Supply Activity, both with the Bureau of State Services, and Dr. Richard L. Woodward, chief of the Engineering Section, Sanitary Engineering Center, Public Health Service.

Of 812 such water supplies, 16 percent did not meet bacteriological requirements, and for 65 percent the specified number of samples was not analyzed.

The officials expressed concern

also for great deficiencies in reporting chemical test results. They underlined specifically the need for analyzing samples for critical chemical elements or groups. When these are suspected as absent, no analyses are made, they explained, asserting that the changing picture of raw water quality calls for modification of this procedure. The Public Health Service is launching a project for determining a broad spectrum of chemicals in the water supplies of 140 carriers, they revealed.

In the authors' opinion, most carrier water supplies are good; the picture drawn from available data should improve with adequate reporting. Commenting on the timeliness of this attention to carrier supplies in view of the growing contamination of surface water and the impending issuance of new drinking water standards by the Service, they urged closing the door on complacency toward the quality

of drinking water and the recognition by health agencies and the waterworks profession of the need for action to meet changing conditions.

Sewage in Soil Reaches Ground Water Wells

It is only a matter of time before the sewage which some communities dispose of through soil absorption contaminates the areas' ground water. This was concluded from studies by the Minnesota Department of Health on the sanitation-water supply complex created when population explodes into new areas ahead of sewerage services.

The Minnesota experience, focusing on areas with widely varying geological patterns within the State, was reported by Frank L. Woodward, director, and Franklin J. Kilpatrick, assistant director of the department's division of environmental sanitation, and Paul B. Johnson, district health engineer.

They explained that abundance of shallow ground water in the metropolitan St. Paul-Minneapolis area had spurred installation of on-site water and sewage disposal, now used by more than 400,000 persons. It is not always recognized that these facilities are only temporary in such high-population areas, they observed.

In 1950, the health department predicted for one of the Twin City suburbs eventual large-scale contamination of ground water from continued lack of central facilities. By 1959, 40 percent of these water supplies contained sewage chemicals. That year in Coon Rapids, where most of the 3,300 homes and firms had individual wells and all used septic tanks for sewage, tests were made on random samples from 98 units for indicators of sewage contamination. The indicators were surfactants (synthetic detergent components) and abnormal concentrations of nitrates and chloride. Nitrate nitrogen in concentrations from 1 to 21 ppm were found in 62 percent of the samples. About 10.2 percent of the total showing 10 ppm or more was cited by the authors as a threat to infant health. Surfactants

appeared in 23.6 percent. There was little correlation between chloride content and other sewage indicators. Tests for coliform organisms in supplies with high nitrate and surfactant content were negative, the authors said.

Startled by these findings, 39 communities with individual systems in the metropolitan area tested a statistically representative number of more than 63,000 wells involved. About 47.5 percent were found contaminated with sewage chemicals. Concentrations varied from a trace to evidence of multiple recirculation of contaminants. The health department found that results of parallel surveys in nine widely scattered communities in the State were comparable.

The authors observed that degree and frequency of contamination are related to well depth. This is most evident in the typical postwar community built on level terrain with ground water readily available at shallow levels in unconsolidated surface mantle. In older communities in such a physical position, with time, sewage contaminants seep into ground water at deeper levels. Also, wells are more likely to be contaminated the nearer they are to the terminal of ground water movement. Undisrupted clay soil layers tend to protect the wells, but limestone aquifers near the surface permit infiltration of sewage chemicals and bacteria.

Most disturbing, according to the authors, is that if nitrates and surfactants are present in drinking water, other soluble constituents of sewage may also have entered the well. They cited the coliform organisms in up to 50 percent of all water supplies in older communities and from 10 to 20 percent of those chemically contaminated in some of the younger communities surveyed, suggesting the possibility of a breakthrough of other pathogens in infectious quantities. The department has therefore urged affected communities to build central water supplies and, in the interim, to regulate construction and reconstruction of individual water supplies. They have also spurred construction of

central sewage collection and disposal systems.

The report stressed the need for setting up specific requirements for depth of wells. Evaluation of the effects on ground water of subsurface sewage disposal is continuing, the authors said. They hope for translation of these efforts into aids for the orderly planning of community development.

Activated Sludge Removes Viruses From Sewage

The activated sludge process is effective for removing enteric viruses from sewage, experiments at the PHS Sanitary Engineering Center indicate.

Dr. Norman A. Clarke, Dr. Shih Lu Chang, and Dr. Paul W. Kabler of the center, and Dr. Robert E. Stevenson, now with the Naval Medical School in Bethesda, Md., reported substantial reduction of type 1 poliovirus and Cocksackie A9 virus.

Since the mechanism of virus removal appears to be an adsorption phenomenon, the authors believe the treatment will also remove other enteric viruses.

Only a slight percentage of the adsorbed virus could be recovered, they stated, indicating that the sludge-virus complex is extremely stable or that most of the virus is inactivated in some way.

When a bench-model continuous-flow activated sludge unit was seeded with 400-4,000 ppm of activated sludge, the process removed 90 percent of type 1 poliovirus. At a 600-1,500 ppm seeding, it removed about 98 percent of Cocksackie A9 virus. Coliform removal averaged 97 percent and fecal streptococcus, 96 percent.

Studies to determine the effect of primary treatment on virus demonstrated that no significant loss of virus occurred during a 3-hour settling period, although some loss occurred during 6 to 24 hours of settling.

It was also demonstrated that type 1 poliovirus was reduced by 60 percent when sewage and virus were mixed for 6 to 7 hours in the unit without activated sludge.

It thus appears, the authors stated, that the suspended solids and other colloidal material, and perhaps toxic substances, in raw sewage contribute to the reduction of virus treated by the activated sludge process. For a completely virus-free effluent, they concluded, additional disinfection is necessary.

Domesticated Algae Yield Food Grown in Sewage

Algae may economically convert wastes into food and fresh water resources, according to workers engaged in research at the University of California at Berkeley.

"It is technically feasible to apply controlled photosynthesis to reclaim water and re-use waste organic matter an indefinite number of times and in so doing to produce unprecedented yields of food and raw materials at costs within the economic reach of most societies," stated Dr. William J. Oswald, associate professor of sanitary engineering and public health.

Oswald said chlorophyll is the bridge by which the energy of sunlight passes to inert matter to create living forms. Control of this process with algae raises the rate and efficiency of this conversion of solar energy, he said. In pilot experiments, yields of organic matter from sewage are up to 10 times the peak yields of conventional agricultural crops. Protein yields are even more spectacular, with the rate of output 10 to 100 times those of agriculture, Oswald said.

In controlled photosynthesis, bacteria and algae grow together in organic wastes held in shallow ponds and exposed to sunlight. In the pond, aerobic bacteria decompose wastes into carbon dioxide, ammonia, phosphate, and other products. The green algae, which fix sunlight energy, transform these products into algal cells. Oxygen is liberated in the process and is available for bacterial decomposition of additional waste material.

In an experimental plant described by Oswald, raw wastes are treated and injected into a shallow earthwork pond lined with impervi-

ous material. The pond is equipped with facilities for mixing, recirculation, and withdrawal of effluent. When passed through a separator, suspended algal cells are removed and purified water is discharged. The algal cells are then treated to remove additional water prior to grinding and storage.

The process, Oswald said, can yield a low-cost protein supplement for animal feed. The bacterial cell material in sewage-grown algae may make it undesirable for direct human consumption, he said.

Since the algal material is grown in waste water, which normally must be treated prior to disposal, the cost of producing the algal material is expected to be about 3 to 5 cents a pound, Oswald said. The estimated cost of algae grown in inorganic nutrients is 25 to 50 cents a pound.

Whether or not the algae are harvested, Oswald indicated, the plants supply the oxygen needed by the bacteria for decomposing solids in sewage, a principle that is now being applied in conventional and high-rate oxidation ponds. Each pound of algae grown produces 1.6 pounds of dissolved oxygen. Once produced this dissolved oxygen is readily available to bacteria for oxidation of additional wastes.

Other products of controlled photosynthesis that may have an important bearing on future water supplies are the direct reclamation of waste water, improvement of water quality, and use of sea water for growing plant food, Oswald said.

During the algal-bacterial process more than 90 percent of the biologically available dissolved organic matter is made insoluble and hence removable from waste waters. Most of the insoluble material consists of algal cells which may be separated by natural precipitation or by treatment with small amounts of chemicals. The residual water is clear, stable, and useful as a water resource.

Uncontrolled algal growth is an increasing nuisance in inland lakes and reservoirs. Removal of controlled algal crops depletes waste water of nutrients essential to algal growth, Oswald indicated, so that effluents from algal ponds may be

more suitable for discharge into natural streams than are effluents from conventional aeration processes.

Photosynthesis may also be used to soften water containing large amounts of calcium and magnesium. The process increases pH which results in precipitation of magnesium hydroxide and complexes containing calcium, ammonium, and phosphate. Precipitates enmesh algae, and sedimentation of both algae and elements of hardness results in water softening. Although this phenomenon has been recognized to occur in natural lakes for many years it is greatly magnified in controlled photosynthesis.

Organic wastes and sea water will produce dense crops of some algal species, Oswald reported, thus making it possible to divert fresh water now used for protein production to other purposes.

Algae Rich in Nutrients

Waste-grown algae were described as a rich source of protein, carotene, ascorbic acid, and the B-complex vitamins by Dr. Bessie B. Cook, associate professor of nutrition at the university.

Reviewing research on algae as food, Cook cited algal output from wastes as a breakthrough in the search for low-cost protein foods for world areas in short supply. High costs of laboratory-produced algae had blocked such uses. Grown in open, outdoor ponds, *Scenedesmus quadricauda* and *Chlorella* spp., in a 10 to 1 ratio, were processed and fed to rats in growth studies.

The dried product contained 40 to 50 percent protein and, by weight, more than 10 times the carotene in spinach and more than twice the vitamin A in beef liver, as well as much more thiamine and folic acid. Compared with beef, algae had more of all the B vitamins except B12. The growth value of the protein was 67 percent of that of casein as the only source of protein. In algae-casein mixtures, the growth value of casein alone was attained only when casein supplied 75 percent of the protein. Cook conjectured that casein may not be the best protein supplement for algae.

The significant rise in growth

value of the protein and digestibility gained by boiling the algal preparation for a half hour suggests future uses only in cooked foods. Despite their high nutrient content, algae cannot serve as an exclusive source of food. To supply amino acids deficient in the algae and to enhance palatability, mixtures with other inexpensive protein foods are now being developed, Cook said.

Public Health Hazards

Dr. Robert C. Cooper, assistant professor of sanitary science at the university, advised also that before waste-grown algae can become a source of human or animal food, it is essential to explore the possible hazards of direct disease transmission, insect production, and odors.

On the roster of likely hazards, named by Cooper, are bacterial, rickettsial, and viral diseases, and larger enteric parasites.

Stressing the lack of an economical process for complete removal of pathogens from sewage, Cooper feels that the potential value of algae demands that we learn to handle the product so that it is within the bounds of safety.

In the university laboratory, 18 out of 100 isolations from algal pond specimens yielded *Salmonella paratyphi B*, variety *java*. Cooper surmised, however, that a decrease in pathogens may be attained by the high daytime pH in the ponds and the drying process before consumption. The fact that many pathogens have specialized nutritive and environmental demands may also have an effect on pathogen survival. For harvesting algae, centrifugation may be preferred because coagulation might intensify pathogen concentration. He also warned against the possible presence of toxic materials in sewage unaffected by treatment and toxins generated by certain species of algae.

Plans for Preventing Plumbing Hazards

A new approach to the control of cross-connection hazards due to back-siphonage as related to adequacy of water utility systems was

suggested by Henry J. Ongerth, supervising sanitary engineer, California State Department of Public Health, Berkeley.

Inadequate mains, breaks in water mains, inadequate sources of supply, unusual demand, and planned shutdowns for maintenance can lower pressure to the danger point, he said. In such circumstances degraded water from faulty plumbing connections can be back-siphoned into the community system.

Ongerth declared that a measure of the adequacy of a community water system can be found in the records of the number of main breaks and shutdowns for maintenance and in the system's pressures in various zones of distribution.

The water industry should be encouraged to close all service cocks prior to planned shutdowns and, if unexpected interruptions of service occur, to flush and disinfect street

mains and consumers' piping, he said.

He pointed out that some water utilities in California require backflow protection devices at the service connections to certain classes of premises (hospitals, mortuaries, and biological laboratories). But two questions still to be settled are under what circumstances should a backflow protection device be required on services with internal back-siphonage hazards and what type of device is necessary.

The objectives of the California policy to control cross connections, according to Ongerth, are to obtain prompt protection against such major hazards as pumping sewage or toxic chemicals, to assess the frequency of interruptions of service, and to get improvements to water systems planned, financed, and constructed so that interruptions of service are reduced or eliminated.

Heart Disease . . .

Busy, Glum Hypochondriacs Are Coronary Candidates

At the 3-year point in a 5-year anterospective study, tentative findings support the observation that men who develop coronary heart disease have significantly higher blood pressure and higher cholesterol than men who do not develop the disease, stated Dr. Oglesby Paul, Dr. Adrian M. Ostfeld, and Dr. Mark H. Lepper. All three are at the University of Illinois College of Medicine, Chicago.

Early findings also indicate a significant difference in the two groups on 5 of 20 scales in the Minnesota Multiphasic Personality Inventory. Men who subsequently developed coronary heart disease scored higher than the noncoronary group on measurements indicating a pessimistic, dispirited outlook, overconcern with the body, and overproductivity in thought and action, they specified.

Detailed dietary data, however, have failed to reveal any differences

between the coronary and noncoronary groups. The absence of differences, Paul and his colleagues suggested, may be attributable to the relative homogeneity of the study population. In this type of population, they observed, fat intake may not necessarily be critical in determining the occurrence of coronary heart disease.

These primary comparisons of the coronary (50 men) and noncoronary (1,867 men) groups are based on the *t* test, they pointed out, since the data exhibit a normal distribution and are numerical. When the study is completed, the dietary and psychological data, at least, will be examined by multivariate analysis.

The study participants are male employees of the Hawthorne Works of the Western Electric Company chosen at random from all those aged 40 to 55 years. Most of them work in light assembly operations, but a few are in managerial, engineering, and clerical positions. Of 3,102 selected for the study, 2,234 agreed to participate. Of this group all those with any evidence of heart

disease at the beginning of the study were excluded, and a few dropped out for other reasons, leaving a study population of 1,917.

With the objective of determining the relevance to clinical coronary heart disease of a long list of host and environmental factors, the study includes the following basic examinations and tests:

- Family history, obtained by questionnaires completed by the participants.
- Complete medical history and physical examination.
- Diet survey.
- Review of physical activities on and off the job through interviews.
- Minnesota Multiphasic Personality Inventory during the first year and additional psychological and sociological tests in subsequent years.
- Somatotyping by measurement and by photographs of three views.
- Body fat measurement using the skinfold technique.
- Laboratory tests, including a 6-foot chest X-ray, electrocardiogram, hemoglobin determination, urinalysis, Kahn blood test, and serum cholesterol determination.

Migration Does Not Alter Heart Disease Mortality

Statistical data on heart disease mortality confirming and elucidating the geographic variations previously reported were contributed by Herbert I. Sauer, acting chief statistician for the Heart Disease Control Branch, Public Health Service.

One point he made was that migration within the United States apparently is not important in determining death rates for coronary heart disease.

"People tend to have coronary heart disease death rates very similar to the rates for the States to which they have moved," he generalized from several findings. Thus, he concluded, there is no evidence that a high proportion of those who leave a State do so because of coronary heart disease, as has been suggested to explain the low rates in Nebraska and North Dakota.

The fact of residence, not the act of moving, is the important thing,

he indicated. Rates in a specific State for persons born there and rates for those born elsewhere are similar.

Considering further this question of birthplace, Sauer said also that persons born in the six States with the highest coronary heart disease mortality rates have high rates regardless of where they are living when they die. People born in low-rate States likewise have decidedly below average rates, but their rates are slightly higher than the rates for persons resident in such States at the time of death.

Or, from another angle, those born in a high-rate State have high rates whether or not they leave the State, although those who die elsewhere tend to have slightly lower rates.

Another question concerns the effect of death rates for the foreign-born. Sauer concluded, from a study of deaths in 1950 in the Middle Atlantic States, that foreign-born residents partly account for the high cardiovascular disease death rates in these States.

Italian and Scandinavian men had rates about average for all white men in the United States, but the Irish, Russians, and Poles had rates as much as 50 percent higher.

According to analysis of rates for nonmetropolitan areas of 116 economic subregions, cardiovascular disease mortality exhibits the same geographic variations as deaths from coronary heart disease and from all causes, Sauer also reported. That is, rates are consistently low for the western plains areas and for some of the middle south. Most of the high-rate areas are along the Atlantic seaboard, with a few along the Great Lakes and the Gulf of Mexico.

These variations persist, he declared, even if the institutional population is excluded (since deaths in institutions are assigned to the usual place of residence rather than the place of the institution). Recalculation of cardiovascular disease death rates for Lincoln, Nebr., on this basis, for example, affects the rate so slightly that it is still one of the 10 areas with the lowest rates, he said.

Reviewing some of the factors

significantly associated with the cardiovascular diseases, Sauer observed that the marked geographic variations afford an additional means for further testing of these associations. He suggested, however, that etiological factors in cardiovascular diseases do not all function in the specific way that the infectious disease epidemiologist expects. He therefore recommended placing continuing emphasis on classification procedures in order to try to "purify" the groups.

Routine Use of FA Method Depends on Local Training

Teaching local laboratory technicians the fluorescent antibody technique for identifying group A beta hemolytic streptococci is the next major step toward putting this procedure into routine use, according to Dr. David Brand, chief of the Section on Rheumatic and Congenital Heart Diseases, Heart Disease Control Branch, Public Health Service.

Since the Public Health Service announced validation of the technique in October 1959, it has sponsored three 2-week training sessions for health department laboratory technicians, Brand reported. When the fourth, scheduled for January 1961, is completed, he expects that all the States and Territories will have participated.

Next the Service will encourage and assist State and Territorial health departments in training local laboratory personnel, Brand said. It will lend equipment and provide other material and technical assistance.

Another problem forestalling widespread adoption of this "rapid, sensitive, and economical technique" is the lack of a commercially available conjugate guaranteed to be specific for group A beta hemolytic streptococci and free from cross reactions. At present, the Communicable Disease Center recommends using only the conjugate it prepares, but, Brand said, satisfactory arrangements for commercial production are expected soon.

Also to be answered is the ques-

tion of the best method of transporting specimens from the field to the laboratory. We hope, too, Brand said, that the fluorescent antibody technique will eventually be refined to a point where group A streptococci can be identified from direct smears instead of having to culture the specimen in Todd-Hewitt broth for 2 to 3 hours.

A fourth problem is the need for both professional and lay education. Because of the time required to identify group A streptococci by conventional methods (several days), Brand believes few physicians routinely take throat specimens from their pharyngitis patients. Yet, he pointed out, a suspicion of "strep" throat must be confirmed by laboratory examination before correct treatment can be prescribed.

The educational phase must be delayed, however, until the laboratories are prepared to handle large volumes of specimens, Brand observed. He hopes a rapid method of screening out negatives can be found to reduce the number of slides that must be read. Perhaps, he suggested, an electronic device can be invented that will rapidly scan specimens for fluorescence, with the positives being carefully re-read by a technician.

Field Test

A field test of the fluorescent antibody technique for identification of group A streptococci by the Montgomery County, Md., Health Department found the technique 92 to 98 percent accurate, reported Dr. William J. Peeples, D. W. Spielman, and Dr. Max D. Moody. This rating is based on the assumption that conventional cultural methods are 100 percent accurate.

Conventional cultural methods agreed in essence with the fluorescent antibody technique (88 to 97 percent conformity), but generally were not as sensitive, they added.

Dr. Peeples is health officer, and Mr. Spielman is assistant chief of the laboratory, Montgomery County Health Department, Rockville, Md. Dr. Moody is assistant chief, Special Research Unit, Communicable Disease Center, Public Health Service, Atlanta, Ga.

Specimens for the test were supplied by private practitioners. During 1959, the first year, they were submitted on conventional cotton swabs in sterile culture tubes. Later, because physicians complained about rigid submission policies, the authors explained, filter paper collection kits which could be mailed to the laboratory were used.

The filter paper specimens had to be incubated 1 to 2 hours longer to obtain the amount of growth apparent when cotton swabs were used, but final results were about the same.

Rheumatic Heart Prospects Deprived of Prophylaxis

Only a small proportion of the country's "rheumatics" are receiving effective, continual prophylaxis, according to Dr. Roy P. Sandidge, Jr., and Margaret A. Evans, of the Heart Disease Control Branch, Public Health Service. Sandidge and Evans presented a 3-year interim report (1956-58) on a 5-year study of college freshmen in cooperation with the American College Health Association.

Although it has been adequately demonstrated that the likelihood of progressive heart damage in patients who have had rheumatic fever can be minimized by continual use of antistreptococcal prophylaxis, Sandidge and Evans reported, its use apparently has not been generally accepted.

More deaths occur from rheumatic fever and rheumatic heart disease in each age group above 5 years than from tuberculosis. Excluding malignant neoplasms, rheumatic fever and rheumatic heart disease account for more deaths in the college-age level than any other disease. These deaths could be reduced dramatically by antistreptococcal prophylaxis for people with known rheumatic disease. Although the mortality statistics show a downward trend, a similar decline in prevalence or severity has not been documented.

Based on data obtained by questionnaire through the cooperation of the student health services, the

study reported on 290,128 college freshmen enrolled in 127 colleges in every State except Oregon and Nevada.

Sandidge and Evans said histories of rheumatic fever or indications of rheumatic heart disease were revealed for 7,460 students, a rate of 25.7 per 1,000 freshmen studied. Of the 7,460 positives, 4,413 either had a definite history of rheumatic fever or a definite diagnosis of rheumatic heart disease, a rate of 15.2 per 1,000.

Reliance cannot be placed on history alone. Students reported as having had rheumatic heart disease numbered 2,011. Of these, 766 had definite rheumatic heart disease, while 1,245 had probable or possible rheumatic disease; but 487 had no history of rheumatic fever, demonstrating the necessity for physical diagnosis regardless of the history.

Rheumatic fever appears to be most prevalent in the Rocky Mountain area and least prevalent in the southern States, according to this study. It is anticipated, Sandidge and Evans said, that the completed study will indicate specific trends in prevalence, clearcut geographic patterns, sex and race differences in prevalence, development of heart disease, and frequency of recurrences.

Nashville Study Challenges RHD Prevalence Theory

Rheumatic heart disease was diagnosed in 103 children, 2.5 percent of 4,039 children examined, in Nashville, Tenn., indicating the disease is as common here as elsewhere in the Nation, reported Dr. Robert W. Quinn and Dr. Ernest S. Campbell. In addition 31 were found to have inactive rheumatic fever or a history of rheumatic fever, without valvular effects. Only 25 of those with rheumatic heart disease had a history of rheumatic fever.

Dr. Quinn is professor and head of the department of preventive medicine and public health, Vanderbilt University School of Medicine, and Dr. Campbell is a former director of heart disease control for the State of Tennessee.

The rate of heart disease, based on clinical examinations, is exceeded substantially, they noted, only by the rate of 6 percent found in some industrial cities in Connecticut.

The hemolytic streptococcus has long been thought to be more frequently a cause of disease in the northern than in the southern States, but recent studies of the prevalence of the organism have challenged this impression, Quinn and Campbell said. Their study, made in 1957 and 1958, was intended to elucidate the geographic prevalence of rheumatic heart disease.

Socioeconomic-Racial Differences

The rheumatic heart disease rates for Negro children and for high, middle, and low socioeconomic groups of white children in Nashville show interesting, though not unexpected, differences, Quinn and Campbell observed. The rate of 4.5 percent in the low socioeconomic group was significantly higher than the rate

for any other group. The rate for the Negro children (2.2) was slightly higher than that for the high and middle white groups (1.6), but it was lower than the rate for all white children combined (2.8).

These differences, they pointed out, are consistent with the generally held view that rheumatic heart disease is more frequent where living conditions are substandard and more crowded. Crowding in the home, according to data obtained in the Nashville study, was associated with significantly higher disease rates in the low socioeconomic white group, but not for the Negro children. This finding suggests the question, according to Quinn and Campbell, is there a lower degree of susceptibility to rheumatic heart disease in the Negro?

Questionnaires answered by the children's parents indicated only one family in five was aware of the child's illness.

so-called house parents. The counselor from the division of vocational rehabilitation continues to see them there and to help them with their problems.

The program at the Vermont State Hospital also includes treatment with ataractic drugs, group therapy, open rehabilitation wards, occupational therapy, graded privileges looking toward the patient's return to the community, industrial therapy and local employment, attendance at meetings, lectures, concerts, plays, and discussion groups, and counseling sessions with members of the rehabilitation division.

Agency Teamwork Helps Rehabilitate Mentally Ill

Combined efforts of several community agencies resulted in successful rehabilitation of mentally ill patients, according to the report of Dr. C. R. Fargher, Dr. William D. Voorhees, and L. S. Rankin, Tacoma, Wash.

Dr. Fargher is director of health, Tacoma-Pierce County Health Department; Dr. Voorhees is director of outpatient clinics, Western State Hospital, and Mr. Rankin is vocational counselor in the Pierce County office, Washington State Division of Vocational Rehabilitation.

In the Tacoma-Pierce County area, cooperation between the health department, the Western State Hospital, and the division of vocational rehabilitation has produced noteworthy results in human benefits and in financial returns. Within a 2-year period, the status of 39 mentally ill patients has changed from financial dependency to successful employment, and from an annual dependency rate of \$47,394 to an annual earning rate of \$103,826. The \$28,174 spent for administration and case service developed total assets of \$151,220, a net profit of \$123,046. In addition, many patients with psychotic symptoms have been able to leave the hospital and to make a worthwhile contribution to society.

In this coordinated program for rehabilitation of the mentally ill, a State vocational rehabilitation division counselor maintains close liai-

Mental Health . . .

Faith, Hope, and Love Relieve Charity

The essence of the success of Vermont's rehabilitation program for the hospitalized mentally ill is the faith, hope, and love exhibited with them by the Vermont State Hospital staff.

This is the belief of Donald M. Eldred, Dr. George W. Brooks, and Dr. William N. Deane, of the Vermont project for the rehabilitation of chronic schizophrenic patients, Vermont State Hospital, Waterbury, and Marjorie B. Taylor, vocational rehabilitation division, Vermont State Department of Education, Montpelier.

The faith of the hospital staff in a patient's ultimate recovery instills the same faith in him, they say, and this leads him to hope that he will find a place in the community when he is well. And, with the commitment of an individual staff member to a patient, "the patient has the first demonstration of the love that gives him faith and hope."

A primary reason for the illness of most mentally ill patients is unsatisfactory and painful interpersonal relationships. If they are to recover they must learn to trust and live with other members of the human race and to believe that other people like and respect them.

The Vermont State Hospital staff believes that anyone can establish a therapeutic relationship with a patient. Ward attendants and work supervisors are made to feel that they can and do contribute to the recovery of patients. They attend professional staff conferences, their opinions are valued, and their abilities are utilized.

The rehabilitation program is a continuation of a 3-year project by the Vermont State Hospital to determine the value of rehabilitation services and "halfway" houses in the treatment of mentally ill patients. As a final step toward their reentry into the community, small groups of selected patients live in these houses in a family situation, supervised by

son with community rehabilitation agencies and the State employment service. In the health department, the mental health division supplies leadership in planning and organizing community services and provides social work, field nursing, and psychiatric services.

The key to the success of the program, however, is the outpatient clinic at the health department, conducted jointly with Western State Hospital. Through this clinic, community agencies have increased their contacts with mentally ill patients and their therapists. In addition, professional hospital staff are using the outpatient clinic as a means of preparing selected patients to reenter the community and seek employment, and hospital physicians, by serving in the clinic, are learning the value of outpatient treatment.

A psychiatrist divides his time equally between the hospital and health department outpatient clinic. Through him, the hospital's viewpoint is presented to the community and the community's viewpoint, to the hospital.

The Washington program has demonstrated the value of teamwork among community agencies in rehabilitating the mentally ill, as well as the benefits of cooperation between a State mental hospital and local health and welfare agencies and the value of psychiatric and field nursing services provided by the local health department.

California Evaluates Local Mental Health Services

As a basis for justification and evaluation of State-aided local mental health programs, California has developed an appraisal system for pointing up areas which deserve more specific and more detailed examination, reported Dr. Edward Rudin, assistant deputy director, community services, State Department of Mental Hygiene, Sacramento, Calif.

According to Rudin, community mental health services must continually test their procedures to make certain that stated goals are being

reached and must reassess and test the premises on which programs are based. The responsibility of the State agency, he said, is to assist locally operated services in bridging the gap between operation and research and to establish community programs which apply accepted mental health procedures as well as procedures for facilitating justification and evaluation of programs. The State agency must also be ready to urge that unjustified procedures or procedures based on inappropriate values be modified or discontinued, he stated.

In California, where the State reimburses approved local mental health programs for one-half their operating budgets, the State mental hygiene department makes quantitative analyses of these programs through statistical reports, Rudin said. Department staff also visit local programs periodically to make sure that, in preparing statistical reports, they are consistent in their application of prescribed definitions.

Reimbursed programs report professional time spent on consultative and educational services in addition to identifying information, duration of treatment, diagnosis, and disposition and condition of patients on discharge. Data received have been correlated and some of the relationships have been reported back to the local programs, Rudin said. Statistical and fiscal data from all local programs have been correlated to determine operating costs.

These data, and the reports of State personnel on their visits to local programs and of program personnel on visits to other programs, have enabled the State "to develop value systems and standards and hence to contribute to evaluation of program services," he concluded.

Psychiatric Evaluations Performed at Home

A program for home evaluation of psychiatric conditions in Philadelphia, according to Dr. Silas Warner, Dr. Burt Flemming, and Dr. Samuel Bullock of the mental health division of the Philadelphia Department of Public Health, evaluates six func-

tioning areas: present mental status and psychiatric history; ability to care for self; availability of responsible relatives or friends; effect on family and community; danger to self and others; and prognosis with or without hospital treatment.

The economic, medical, and social problems of the aged, creating loneliness, malnutrition, and chronic physical disability and poverty present one of the questions: how much is primarily psychiatric and how much is secondarily due to neglect? Because of the reluctance of hospitals to accept elderly patients, referral to community agencies is made whenever possible.

Another patient encountered in home evaluation is the "slow suicide," who doesn't want to live and refuses hospital treatment. Involuntary hospitalization of such an individual raises the question of his rights and self-determination, the authors said.

Quite often a husband or wife declares the other mentally abnormal, each in a convincing fashion. Sometimes there is mental illness in both. Home psychiatric evaluations are particularly effective in ascertaining the actual family situation, they said.

Another perplexing situation occurs when a family member becomes mentally disturbed yet can function marginally in daily living. Again, it is the home evaluation which can best determine the effect of such illness upon others in the family.

The dangerous patient, dangerous to the community and the investigator, presents an exceptional challenge, according to the authors. For these patients, evaluations in a hospital are more desirable than in the home.

In the miscellaneous category fall patients whose behavior is abnormal toward one or two persons, but whose mental status is otherwise normal. Often their aggressions are aimed against doctors, and home evaluations are not recommended if the patient is aware of the investigator's profession.

Psychiatric evaluations in the home, the doctors pointed out, provide a means of dealing with conditions which fall into a "no man's

land" between social agencies and the police. Involuntary hospitalization, under court order, is an effective and desirable alternative to police action, but the authors strongly recommended that if at all possible the patient and family be persuaded to seek help voluntarily.

Screening Spots Minority, Halves the Caseload

Routine psychiatric screening can predict the segments of a population which will use a disproportionate amount of the services of health and welfare agencies, according to Dr. Richard H. Svihus, epidemiologist, U. S. Navy.

This was borne out at the Naval Training Center, Great Lakes, Ill., Svihus said, by a study designed to test the hypothesis that among military recruits there are individuals who will make excessive use of health and social facilities, and that these individuals can be identified at the time they enter recruit training.

The disproportionate demands of marginally adjusted individuals on military medical and social facilities are reflected in manpower planning. Svihus stated that separating an increasing number of marginally adjusted recruits during basic training does not result in fewer psychiatric separations during later service because a point of diminishing returns appears.

Therefore, according to Svihus, a good military selection procedure must be sensitive enough to "screen out" the men unfit for duty and yet specific enough to "screen in" those who can adjust to military life without making excessive demands on medical and administrative facilities.

Among the Great Lakes study group, less than 10 percent of the recruit population had such a multiplicity of problems that together they used over half of the time of the chaplains and the disciplinary officers, one-fourth of the time of the psychiatrists, and nearly one-fifth of the time of the medical officers. Recruits who visited several

agencies tended to make multiple visits to each agency, Svihus noted.

Routine pretraining psychiatric screening was surprisingly sensitive and specific in predicting which recruits would use combinations of agencies and which ones would not, Svihus reported. For four-fifths of those visiting all four agencies and for about three-fourths of those visiting two or three agencies, pretraining psychiatric screening had predicted that they would require a multiplicity of services to cope with their problems.

Thus, Svihus concluded, this apparent relationship between the amount of use of health and social agency services needed by an individual and the score he attains on a psychiatric screening procedure should be used to sharpen the optimal cutting point of "screening out" and "screening in."

Adult Retardates Upgraded With Care and Counsel

Mentally retarded adults are capable of greater production than has been presumed feasible, asserted Dr. Gunnar Dybwad, executive director, National Association for Retarded Children, Incorporated. He discussed aspects of developing the capacities of each retardate, including additional medical care, sheltered workshops, and counseling.

Noting that physical disabilities often severely interfere with performance, Dybwad charged that medical care for the retarded has been grossly neglected and urged that it be improved.

Clinical evidence, he said, increasingly suggests that classical designations of moron, imbecile, and idiot are no longer adequate, and newer definitions have not been sufficiently refined to merit adoption. He stated that retarded children may so improve that they will move to a higher traditional classification and recommended periodic clinical reevaluation based on observation of functional performance of each retardate rather than abstract testing.

Describing the objectives of sheltered workshops, Dybwad pointed out that successful placement of the

mentally retarded will depend on the quality of counseling they receive and predicted the necessity for specific psychotherapeutic work for some enrollees.

Dybwad referred to practices in Holland and said that much could be learned by studying foreign facilities. He cited Aid to Retarded Children, Incorporated, in San Francisco, as a local organization which had successfully pioneered in using group guidance as an important part of its workshop program.

Emphasizing the need to eliminate prejudice against retarded adults, Dybwad discussed the type and extent of services that might become available to mental retardates and to other handicapped persons in the workshop milieu. He reiterated that additional services and facilities must be provided to overcome the results of prejudices and prejudgments directed against the retarded infant and young adult.

With the introduction of the antibiotics and a generally more healthful regime at home, the lifespan of retardates is lengthening, Dybwad said. Therefore, the number of adult retardates will increase within the next decade or two, and many more facilities, with additional personnel to operate them, will be needed in the future, he concluded.

Methods for Evaluating Mental Health Programs

One of the principal deterrents to national evaluation of community mental health programs is lack of systematic statistical data and epidemiological information on the mental health of an area and on the incidence and prevalence of mental disorders, according to Dr. Morton Kramer, Earl S. Pollack, Ben Z. Locke, and Dr. Anita K. Bahn, of the Biometrics Branch, National Institute of Mental Health, Public Health Service.

Nationally collected data can indicate successes or failures of programs and techniques, as well as problems of geographic areas and population groups, and can provide a basis for anticipating needs for personnel and service. So far, how-

ever, it has been possible to collect only limited facts on the effect of community programs on prevention and control of mental disorders. Research by community agencies is needed to develop indices for evaluating mental health programs.

During the 1950's the NIMH and State Mental Health and Hospital Authorities have cooperated in collecting comparable national statistics and carrying out special studies, the authors stated. These data concern characteristics of patients coming into these facilities, their rate of movement back to the community, the resultant resident population, and, for clinics, some measure of services provided.

Interpretation of differences in the indices derived from these data are limited, however, since they provide no baselines for assessing changes in incidence of specific mental disorders or systematic data on the characteristics of patients treated in other types of facilities caring for the mentally ill.

The growing number of new treatment facilities for mental patients increases the difficulty of collecting more complete data, Kramer said. However, the Biometrics Branch is endeavoring to extend the reporting universe to include some facilities not now reporting, such as residential treatment centers for emotionally disturbed children and psychological and other facilities providing services to the mentally ill. More detailed data may be collected from such important treatment centers as general hospitals admitting psychiatric patients. Assistance is being given in the development of a case register for mental illness comparable to those used for cancer and tuberculosis.

According to Kramer and his colleagues, further advances in development of objective measures of the degree of impairment and psychological changes in patients and of methods of obtaining data on their adjustment to the community will depend on future gains in scientific knowledge.

These fibers, explained Kreshover, are found mainly in stress regions, such as periodontal membranes, ligaments, and tendons. Embryological studies suggest development associated with mucopolysaccharide output and maturation.

Mineralization

Kreshover pointed out the lack of convincing data on the mineralization of dentin and enamel, a basic hypothesis stressing capacity of both substances to resist acid solubility *in vitro* and the need for diets adequate in calcifying components. Data from Sobel and associates suggested that variability in carbon dioxide and phosphate ratios in dentin and enamel is a factor in caries etiology. Recent NIDR studies, however, question these relationships, he said.

Studies by McClure at the institute, associating the solubility of mineral phosphates with caries, underline the chemical vulnerability of enamel tooth surfaces.

For protein in tooth enamel, one NIDR study indicates a noncollagen composition. Also, McClure produced dental caries in white rats using as cariogenic agents heat-processed skim milk powder and heat-processed cereals. The dietary addition of the amino acid lysine inhibited caries, said Kreshover. Parallel cariogenic effects were produced by low protein diets with a high percentage of wheat flour, dry bread, and wheat biscuits. Another cariogenic diet consisted almost solely of whole millet flour; it contained no free sugar.

Fluorides

Data on children, gathered for about 12 years by Arnold, McClure, and White, show significant inhibition of dental caries from daily use, during formative tooth periods, of sodium fluoride tablets with 1.0 milligram of fluoride. A similar German study of 4 years brought the intensity of caries inhibition, as reported by Wrzodak, to an average of about 20.09 percent for first, second, and third grade children. Recently, said Kreshover, a study by Louisiana State University included in the school lunch of children, starting at

Dental Care . . .

Foresees Caries Control Via Diet Factor Study

New avenues toward complete control of dental caries were envisioned by Dr. Seymour J. Kreshover, associate director of the National Institute of Dental Research, Public Health Service, as the possible outcome of today's research on cariogenic factors in the human diet and the effects of protein and amino acid metabolism on oral health.

Outlining the high points of dental research and the genesis of each in terms of previous findings, Kreshover referred to a sequence of studies leading to the recovery of enterococcus and microaerophilic group A hemolytic streptococcus from carious rat molars. This stimulated studies at the institute, where Keyes demonstrated that carious lesions could be induced as well as transmitted by inoculation or exposure to a micro-

flora in feces of caries-active animals.

Keyes and Fitzgerald proved that only certain strains of streptococci induced carious lesions in otherwise resistant animals. These investigators, remarked Kreshover, uniquely labeled streptococci by making them streptomycin resistant.

In a number of centers, research on the vulnerability of mucopolysaccharide cement substances and the collagen of connective tissue to bacterial enzymes laid much groundwork for a technique found at NIDR which measures a decrease in collagen rather than the hydrolytic evidence of enzymatic digestion of collagen.

The development by Fullmer of a selective stain, peracetic-aldehyde-fuchsin-Halmi, allowed the identification of non-birefringent fibers, heretofore unrecognized, in areas thought to be composed solely of col-

6 years of age through age 10 years, a pint of milk with 1.0 milligram of fluoride. After 4½ years, there was a 78 percent decrease in caries in teeth erupting during the program.

Among other findings mentioned were those of Zipkin and Geever who analyzed and examined histologically selected bones of persons who had used water with 0.1 to 4.0 ppm of fluoride for the previous 10 years. The fluoride percentage was a little more than 0.5 percent on a dry, fat-free basis. These tissues showed no significant histological change.

The Outlook

According to Kreshover, much work is focused on the calcification process. Interdisciplinary teams are studying the structural and physicochemical interrelationships between inorganic crystals and their organic matrices. He cited cooperative research on mineralizing of the turkey leg tendon, a simple model tissue resembling bone and made up of collagen and mineral apatite. Tests have yielded data on the sequence and anatomical habits of crystal deposition. A current lead which he believes promising is the observation that intraperitoneal mineralization will take place even when the test material, in this case, purified collagen, is implanted in dialysis bags. This suggests study of *in vivo* mineralization of matrices whose composition is chemically definable and experimentally controllable.

In conclusion, Kreshover predicted advances in a number of areas including the biosynthesis of collagen and the relationship of salivary protein to oral disease.

Specialized Dentists Lack Holistic View

Fragmentation of dentistry into specialties has created little areas which lose significance in terms of real healing, in the opinion of Dr. Wendell L. Wylie, associate dean and professor of orthodontics of the University of California School of Dentistry, San Francisco.

"We have taken a small portion of the entire body, the oral cavity, and defined it as our domain," Wylie said. "We have established certain specialties, such as oral surgery and orthodontics, and then taken the field of restorative dentistry and broken it up still further into crown and bridge, denture prosthesis, and operative dentistry. Those who cleave to operative dentistry deal with dental caries, yet few in the field are much concerned with the etiology of caries and its prevention. Nor are many of them concerned with research in the material they use every day."

Both the service aspects of dentistry and clinical research would benefit if some effort were made to draw together these fragments, he stated.

Reviewing advances in clinical dentistry research, Wylie said that high rotational speeds not only lessen patient discomfort but cause less trauma to the pulp. They also help to offset the heavy dental workload. A coolant must be used, however. There appears to be no real hazard within the average dental practice.

Wylie commended workers in oral roentgenography for their energy in educating dentists in techniques to reduce patient exposure. Reduction is by collimation, which cuts down beam diameter, and by use of lead aprons and shields.

Next he described a pantomographic device producing in 40 seconds on a single sheet of film a panoramic view of maxilla and mandible—all with less radiation exposure than with conventional equipment.

Orthodontists can now use lighter forces than those formerly applied, decreasing the hazard of undesirable effects on teeth and supporting structures and allowing longer intervals between patient visits. Another development is the use of methods to fabricate appliances similar to those of restorative dentists, thus permitting the delegation of work to auxiliary workers, he observed.

Recent tests favor the relative accuracy of rubber base material for impressions over silicone substances. Acrylic resins in operative dentistry,

without liners, excel in solubility and lessen frequency of pulpal irritation, but they are inferior to silicates with respect to recurrent caries and dimensional stability.

Among other findings touched on by Wylie was that through use of radioactive phosphorus, an effective seal of root canals can be achieved with a resin compound. Also, periodontal research has concluded that a healthy marginal tissue can be produced around a tooth, if the tissue is inelastic and resembles scar tissue.

Topical Fluorides Gain As Michigan Sets Pace

For the Nation's 30 million children in the 5- to 16-year age group who are not drinking fluoride-bearing water, topical fluorides give the best protection against dental caries, in the opinion of Dr. John K. Peterson, director of the division of dental health, North Dakota Department of Health, Bismarck. He stressed, however, the superiority of fluoridated water.

The scope of topical fluoride usage throughout the country has probably not broadened appreciably since 1958, when the American Dental Association surveyed State dental division programs. Twenty division directors reported no State-level topical fluoride programs and nine were not inclined to begin any, given funds and personnel. Rhode Island and Vermont reported routine, adequate programs.

A 1960 survey by Peterson showed 24 of the 49 States replying now have topical fluoride programs conducted by the State, and 9 more have local programs. Directors in 13 States reported using sodium fluoride; 11, stannous fluoride; and 9, both.

Michigan now has the largest and most comprehensive coverage, Peterson reported. This 90 percent self-supporting program was expected to reach about 95,000 children in 1960, through local summer activities and school-year community projects. Communities with 75 or more children signed up with program plans are eligible for State planning assistance, Peterson said. "Those with

fewer patients are urged to combine plans. During the first 2 weeks of the summer program, using multiple-chair techniques, up to 5 children an hour are scheduled for prophylaxis and the first application; and 15 children are seen an hour for the second through fourth applications.

Among other State programs mentioned by Peterson were:

- In New Hampshire, the Dental Hygiene Conference gives dental hygiene and sodium fluoride applications to children of 3 years of age through kindergarten.
- In Connecticut, State personnel treat 5,000 children a year and 69 projects are carried out locally. A single hygienist there can treat an estimated 1,000 children each school year.
- Maine State health workers treat 8,000 children annually, with priority to communities without public water supplies. In the spring, first, fourth, and seventh grade children are treated, and the second, fifth, and eighth, in the fall.
- Almost 10,000 Indian children were treated in 1959 in the Public Health Service's expanding program.

An estimated 750,000 children may have received topical fluoride applications in 1959 through official efforts, said Peterson, adding that more comprehensive use of this treatment would be achieved if dental practices were modified to permit topical application by the dental hygienist in all States.

Peterson commented on the apparent paradox in the requests of about 20 percent of the country's private dentists per year for stannous fluoride and for instructions as to use, and the fact that only 2.2 percent of dental patients under 20 years of age reported receiving topical fluoride applications in 1959. He estimates that only about 5 percent of the children in the 5- to 16-year age group without benefit of fluoridated water are receiving topical fluoride.

Peterson observed that the standard four-application, 2 percent topical sodium fluoride series is cumbersome and time consuming. Also, good results are not immediately apparent. In fact, much about the duration, kinds, and limitations of the protection remains undefined, he

said. With continuing and expanded research, he believes a much more effective topical treatment than sodium fluoride will be found, probably in some stannous fluoride combination.

Stannous Fluoride Paste As Dental Prophylactic

Stages in the development of a stannous fluoride prophylaxis paste by the U.S. Air Force were reported by two dentists associated with the School of Aviation Medicine, Lt. Col. Norman O. Harris and Maj. Vincent A. Segreto.

Preliminary research by the school on stannous fluoride dental prophylaxis pastes during 1958 was spurred by what they called the "pyramiding backlog of carious lesions" among Air Force personnel. Although more than 1.5 million restorations were inserted in 1958, more than 3 million were still needed. These figures, they pointed out, reflect the estimated 10 years of backlog of comprehensive dental needs throughout the Nation.

Evidence of the superiority of stannous fluoride over sodium fluoride led to a research project for developing a prophylactic paste containing stannous fluoride and incorporating a stable chemical system that would block hydrolysis and oxidation of this anticariogenic agent. With silicone for moistening and silex for abrasion, the mixture proved stable for at least a year, and it was four to seven times as effective as a 10 percent topical application of stannous fluoride in the protection of surfaces of extracted teeth in *in vitro* decalcification.

Following pilot study reports of a number of adverse systemic and gingival reactions and low acceptance, the concentration of stannous fluoride was reduced, and sodium borate was added to mask the taste.

Trials at 232 Air Force bases by a large number of dentists and oral hygienists found the taste satisfactory but abrasiveness inadequate. This deficiency was much less apparent among adolescent and juvenile groups, the authors said.

A special rinsing technique is re-

quired in applying the paste, which pigments definitely hypocalcified areas, carious lesions, and sometimes silicate restorations. Among other reported effects is the desensitization of the exposed cementum. The authors concluded that there is no major contraindication in use of the paste by patients of all ages, so long as they are capable of following rinsing instructions.

Key Figures and Timing Decide Fluoridation

Professionally trained people need to find natural neighborhood leaders to transfer the knowledge of fluoridation to individuals of different background and interests, according to Dr. Polly Ayers, director of the bureau of dental health, Jefferson County Department of Health, Birmingham, Ala.

The "right mosquitoes," the effective community leaders, she pointed out, are not necessarily of the same kind in each neighborhood.

In one community, efforts to obtain votes for fluoridation were carried on by a large Citizens Committee for Fluoridation, composed of bankers, lawyers, dentists, physicians, labor leaders, engineers, chemists, well-known business men and women, and leaders of civic clubs, federated clubs, and PTA's. The usual promotional techniques were used: an office rented; an executive secretary employed to coordinate activities; radio talks given and TV appearances made; literature distributed and stories written for the newspapers.

Despite hard work of the citizens committee and the scope of the promotional efforts, only one precinct, predominantly populated by students, faculty members, and employees of dental and medical schools, voted overwhelmingly for fluoridation, Ayers related. Why? It was the lack of the "right mosquitoes" to carry the information on the merits of fluoridation from the committee to the voters who were not impressed by the campaign conducted by the "leading" citizens.

In contrast, in another community, the local health officer sought

approval of the local dental society for employment of a dental hygienist to apply sodium fluoride to the teeth of school children. As the individual was neither well trained nor licensed to practice dental hygiene, the dentists voted against the project. When the press published this action, the readers accused the dentists of acting in selfish interest.

The dentists themselves, said Ayers, then became the "right mosquitoes." Though continuing to oppose the employment of an unqualified person for a public program, the dentists petitioned the health department to fluoridate the public water supply, on the grounds that it would, over the years, save more teeth at less cost than any other known procedure. The dentists regained respect, and the water supply became fluoridated.

In a third community, one dedicated "right mosquito" did the job

almost alone. Though the citizens had heard talks on fluoridation and were well informed on the value of it, no action followed until one key figure was reached. She was an educated woman with several grandchildren who had moved into the community from a city which had pioneered in fluoridation. Her husband was a member of the city council; her son a member of the water board. After she was visited by the health officer, the dean of the dental school, and directors of the bureau of sanitation and the bureau of dental health, fluoridation began without further ado.

Ayers reiterated the need for information about fluoridation to be put into effective form; the need for the intended audience to be prepared for the information; and the need to find influential neighborhood leaders to swing opinion behind fluoridation.

authors stated, the illegitimate children did not constitute the majority on welfare rolls: 63 percent on the rolls were children born in wedlock as of August 1959.

The unwed mother and her child are only one phase of the larger community problem of unstable family life evidenced by the great number of broken homes, the authors said. The stability of family life depends on a favorable environment. Inadequate, slum housing still remains a serious problem for Negroes and Puerto Ricans. Until suitable housing is provided, the authors declared, a substantial reduction in illegitimate births, infant mortality, morbidity, and delinquency cannot be expected.

For all ethnic groups there is a need for education in good nutritional habits, prenatal care, and sex education which deals frankly with promiscuity, venereal disease, and abortion, they said.

The authors suggested a rehabilitative program for the unwed mother that would encourage her to retain and rear her offspring for productive citizenship. This program would necessitate, they said, low-cost public housing, adequate public assistance plus day-care facilities for working mothers, social service counseling, and complete medical care for mother and child.

Maternal and Child Health . . .

Unmarried Mothers Linked to Slums

The sharp increase nationally in the number of illegitimate births during the last decade has been even more striking in New York City. Dr. Jean Pakter, Dr. Harold Jacobziner, and Frieda Greenstein, all with the New York City Department of Health, and Henry J. Rosner, New York City Department of Welfare, attributed this rise mainly to the immigration of low-income Negroes and Puerto Ricans whose adverse living conditions discourage stable family life and encourage out-of-wedlock unions. However, the number of births to other unmarried mothers has also increased significantly, they said.

In analyzing data relating to illegitimate births in New York City, the authors classified the ethnic groups studied as white, excluding Puerto Rican; nonwhite, excluding Puerto Rican; and Puerto Rican.

Generally, the unmarried mother and her infant were greater health

risks within each ethnic group. Their rates for maternal complications of pregnancy, puerperal mortality, and prematurity, as well as for fetal and infant deaths, were significantly higher. The authors found, however, that the married nonwhite mother and her offspring were more vulnerable than the unmarried white, indicating that health status is influenced more by environment than by marriage. The higher maternal death rate among the unwed mothers, they said, was due primarily to illegal abortions.

About two-thirds of the unmarried mothers and their children received financial aid from the welfare department, primarily through aid to dependent children and to a lesser extent through home relief, foster, and institutional care programs. Of the illegitimate children on the welfare rolls, 14 of 15 Puerto Ricans and 9 of 10 Negroes remained in their own homes, but 1 of every 2 white children was given up for foster or institutional care.

Contrary to popular opinion, the

Ophthalmia Prophylaxis Wasteful If Risk Is Low

Routine use of prophylactic drugs to avert ophthalmia neonatorum is justified only when risk of gonococcal infection is high.

Dr. Morris Greenberg, the late director of the bureau of preventable diseases, and Dr. Jules E. Vandow, chief of the division of social hygiene, New York City Department of Health, reached this conclusion in a study of the incidence of ophthalmia neonatorum in 472,580 infants born in 96 hospitals in New York City during 1956-58.

Even in infants exposed to gonococcal infection, it is questionable whether a single application of any drug will invariably prevent ophthalmia, Vandow stated. Pro-

phylaxis, he cautioned, should not replace careful observation of the baby's eyes during the postpartum period.

But there is no doubt about the cure, he concluded. No case of blindness or of serious eye injury followed the 49 cases of gonococcal ophthalmia in New York City. An injection of penicillin cured the disease promptly.

The instillation of a 1 percent solution of silver nitrate in the eyes of all newborn infants, mandatory in New York City from 1922 to 1955, was predicated on the assumption that all infants were equally exposed.

Admission of other prophylactic procedures in 1955 and repeal of mandatory prophylaxis in 1956 permitted comparison of the various prophylactic methods in a study group large enough to offset the low ophthalmia incidence.

The data did not permit definitive resolution of the merits of the various preparations, but the authors found considerable difference in risk of gonococcal infection among ethnic and socioeconomic groups.

In areas with unhealthful conditions and high incidence of venereal disease, prophylaxis sometimes failed, irrespective of the method. In districts with better living conditions, no cases occurred whether prophylaxis was used or omitted, Vandow reported.

This finding, he emphasized, clearly shows the importance of host and environmental factors in determining which populations might benefit from prophylaxis.

Of the 49 cases of gonococcal ophthalmia occurring during the 3-year study, 22 were among approximately 86,000 infants who received no prophylaxis, 17 among some 259,000 infants who were treated with silver nitrate solution, 9 among 80,000 infants treated prophylactically with antibiotic ointments or solutions, 1 in 14,000 receiving salt solution, and none in 33,000 who were given an intramuscular injection of 50,000 units of penicillin.

Evaluation of host and environmental factors, such as type of hospital and service and socioeconomic status of the mothers, revealed that

only 1 case of gonococcal ophthalmia occurred among 291,000 infants delivered by private physicians. The other 48 cases occurred among 181,000 ward patients.

The incidence was practically the same whether the ward patient was in a municipal or a voluntary hospital, with 28 cases among 102,000 patients in municipal hospitals and 20 among 79,000 ward patients in voluntary hospitals.

For Negro patients, the incidence was about 20 times as high as in white patients. Among white patients, the incidence ratio for infants of Puerto Rican origin was 7 to 1.

Similar types of hospitals had different experiences with the same methods of prophylaxis, depending on the socioeconomic status of their patients.

Alternation of different kinds of prophylaxis in most of the hospitals prevented proper evaluation of silver nitrate and the other drugs, the report stated. However, there were indications of comparative efficacy when the risk of infection was comparable.

In one hospital drawing patients from the lowest socioeconomic section, the incidence of gonococcal ophthalmia was significantly lower with the use of silver nitrate than when bacitracin was used or prophylaxis was omitted. Two cases occurred among 7,219 infants treated with silver nitrate solution, a rate of 0.28 per 1,000. In the same hospital there were 8 cases among 1,996 infants who had no prophylaxis, a rate of 4 per 1,000 and 7 cases among 1,935 infants treated with bacitracin ointment, a rate of 3.63 per 1,000 live births.

Psychologist Evaluates Preschool Deviations

Psychological services in child health clinics for detecting physical and developmental abnormalities in infants and preschool children are unquestionably valuable, according to a pilot study conducted by Dr. Caroline A. Chandler, Maryland State Department of Health; Dr. Lenore J. Bajda, Montgomery County (Md.) Health Department;

and Dr. Liselotte K. Fischer, Children's Hospital, Buffalo, N.Y.

The 9-month study, 1958-59, included only children already registered in Montgomery County clinics. During this period 43 children were referred for evaluation to a skilled developmental diagnostician. Essentially, the children referred were considered by the physician, nurse, welfare worker, or mother to be below par in general level of activity and organization or motor control, or both.

One child health clinic, designated as an open clinic, was selected for the psychologist to attend on a regular monthly basis. This clinic was chosen because it had a relatively small caseload, with adequate working space for the psychologist, and was staffed by a pediatrician and nurses who were interested in the study. Children in the open clinic were selected jointly by the psychologist, the clinician, and the nurse during regular clinic sessions.

A consultation clinic was held bi-monthly in 10 different health centers throughout the county, and the children attending it were sent to the psychologist only by referral. The reason for referral, perinatal and disease history, and pertinent social data were prepared by local public health nurses and submitted to the psychologist for review prior to the clinic visit.

Reasons given for referral to the consultation clinic were questions of developmental retardation and school readiness; behavior, personality, and speech problems; request for evaluation by the welfare board; request for guidance because of broken home; sibling of problem child; and convulsive disorder.

In the open clinic only one referral of eight showed no family or patient pathology. Five families had severe pathology, and in four of these the patient also showed this condition. Pathology was considered severe if either parent was mentally ill or if frank social pathology was present as evidenced by a broken home, illegitimacy, and so forth.

Of the 35 patients seen at the consultation clinic, severe pathology was noted in 25 families and 15 patients. In 10 instances, both fam-

ily and patient demonstrated severe pathology. Data from both clinics indicated that family pathology was severe in 70 percent of the patients referred.

The majority of the children referred were 2 to 5 years old in both the open and the consultation clinics. The few children referred who were under 2 years had full-blown, not borderline or incipient, deviations. The authors suggested that cues to developmental deviations in infants may be too subtle to be picked up by the usual referring personnel, even with the help of a checklist. They pointed out, however, that possibly the duration of the teaching experience provided by the psychologist in this study was too brief for the clinic staff to acquire the skills necessary to alert them to earlier deviations. On the other hand, not a single referral was considered inappropriate by the psychologist. Evidently, the authors said, the preliminary orientation given to the staff was sound and the criteria for referral well chosen.

A 6-month followup of the implementation of recommendations made by the psychologist revealed that for most of the patients reevaluation was recommended after an interval of 1 to 2 years. For such recommendations as additional medical evaluation, foster home or foster home change, special learning activities, psychiatric observation and care, and adoption, appropriate action was either completed, pending, or no longer indicated.

The followup also highlighted several community deficiencies, the authors said. Facilities were available for only one-third of 18 children recommended for nursery school. Although 17 of the 43 children tested were already receiving casework service from the welfare board, only 1 of 12 additional families needing the service was able to obtain it.

Finds States Lacking Aid for Needy Child

That far too many States provide few or none of the essential health services for needy and dependent children was indicated by Pearl

Bierman, after reviewing public welfare policy and practice in the aid to dependent children and child welfare service programs.

Bierman, a medical care specialist, American Public Welfare Association, Chicago, Ill., proposed several factors for consideration in determining how these programs can be strengthened.

Should the care financed for children who are deprived of financial support or care from their families be better than the care available to and received by other children in the community? Bierman asked. From a realistic viewpoint, she wondered if such services could be better and whether they are actually available in the community.

What is the welfare department's responsibility beyond the framework of a good program, well financed and with staff responsibility clearly indicated and implemented? Bierman asked. In foster care the agency serves in lieu of a parent. In aid to dependent children the parent is primarily responsible for his children's health. The department's services may be educational or advisory, but it cannot direct a parent in what he must do in order to receive aid for his children.

The health department has a responsibility to help the community achieve a high level of health services, Bierman said. This responsibility may include coordinating existing services, assuring that necessary facilities are available, and providing health education and nutrition services. However, she stated, whether the health department should be the administrative agency for a public medical care program cannot be answered with a categorical yes or no. The answer depends mainly on the community, on community and State traditions, on the health department's interest, and on the fiscal picture.

Administration, Bierman pointed out, is not the only way in which the health department can give specific help. Consultation service, both as to program and on individual cases, can be highly useful to the welfare department. The full responsibility for this service has not been accepted generally by health depart-

ments, she maintained. Welfare programs often suffer because qualified medical administrators are not available.

Wise Observation Detects Early Vision Problems

The necessity for alertness in parents, school teachers, school nurses, and physicians in detecting signs and symptoms of eye diseases in children is extremely important, asserted Dr. Owen C. Dickson, associate clinical professor, University of California Medical School, Berkeley, so that treatment can be instituted when it is most effective.

Intelligent observation, Dickson said, will reveal infections of the eye, such as redness or swelling of the lids, discharge, and styes, as signs of disease. Tilting of the head, which may indicate muscle imbalance; frequent blinking, possible corneal pathology; squinting, possible myopia; and abnormal holding of reading material, all require immediate diagnoses.

Dickson stressed the importance of detecting muscle imbalance in infancy. Amblyopia, resulting from suppression, if not discovered until the age of 5 will frequently be so deep that corrective measures may not succeed in preventing "so-called blindness." Also, a tumor which demands immediate attention can rarely be treated effectively if not detected until school age.

Dickson made a plea for the proper psychological handling of those children for whom patching does not relieve amblyopia, for whom surgery produces a cosmetic but not a functional result, or for whom injury or other organic disease in one eye reduces vision. Children are highly adaptable and adjust rapidly and completely. Often, it is the attitude of the parents or other sympathetic persons which creates psychological problems, he said.

Although screening tests may indicate normal findings, Dickson said any small or infrequent deviations of the eyes, related headaches, persistent word jumping, reversal, line jumping, or abnormally slow reading should be examined by the school

nurse for evaluation or by the physician for definitive care.

Fundamentally, Dickson said, screening procedures should consist of the Snellen visual acuity test at distance; a plus sphere test for hyperopia; and a motor test, such as the cover test, to determine marked phorias or tropias. Tests of fusional ability and smaller phorias are too complex for routine procedure. He recommended that the tests be performed by qualified school personnel with the guidance of professional counsel and training.

Dickson mentioned two ophthalmological aspects in the field of reading readiness: the large refractive error, for which correction to enable the child to see both the blackboard and printed material properly presents no problem, and handedness. When the controlling eye is on the opposite side of the hand used, symptoms of poor visual imagery and memory, reversals in reading and writing patterns, and mirror writing are apt to occur. Restoring handedness and the controlling eye to the same side has effected in many patients marked to complete relief

of these symptoms, as well as stuttering, he said.

For those children who do not respond to the flashcard method of teaching reading, Dickson suggested that combinations of phonetics and kinesthetics, that is, association with other muscular or mechanical functions in recognizing words or letters, be tried.

In discussing common eye injuries, Dickson emphasized the importance of educating the public about such dangers as B.B. guns, sharp objects, flying objects, and spray liquids. He prescribed several first-aid measures to be taken when these injuries occur.

All children needing glasses should have either heat-hardened or plastic lenses, both of which withstand many times the impact that fractures ordinary glass lenses, Dickson maintained. Although fragmented plastic or safety-type glass may cause an eye injury, the damage is almost always less than if no protection is provided. Even though one-eyed or amblyopic patients do not need corrective lenses, Dickson feels they should have the benefit of some form of safety lenses.

were Dr. G. Richard Wendt, professor of psychology, University of Rochester, Herbert Eichler and Charles L. Fry, graduate students in psychology at the university, and Dr. Ruth A. Lawrence, instructor of pediatrics, University of Rochester School of Medicine and Dentistry.

For the study, interviews were conducted with an experimental group of 226 mothers and a control group of 217 mothers, and questionnaires were completed by about 87 percent of their children. Children in the experimental group, in the fifth grade when the study was made, had received careful medical appraisals at school each year from the first through the fourth grades. The control children, in the sixth grade, had been examined by either their private physician or a school physician on entrance to school and again in the fourth grade.

No significant differences in responses to the study questions between the experimental and control groups were apparent, Yankauer said in summarizing the findings. The interviews with the mothers, however, did reveal a significant difference between high and low socioeconomic groups. These differences (along with certain other findings) indicate the need for "tailoring all features of a school health program to the individual school," he declared.

Modern School Health

In another paper, Dr. Paul B. Kinney, chief physician of the Pasadena, Calif., city schools indicated that he was less concerned over the "statistical substantiation of the known futility of routine grade-level health examinations" afforded by the Yankauer and Lawrence studies than over the implication that there are school health programs "still operating in the dark days."

A modern school health examination program does not include repetitious routine grade-level examinations, according to Kinney. In the Pasadena schools, he said, health examinations are given only to children with known or suspected health liabilities selected by the school nurse for appraisal and to

School Health . . .

Report Questions Frequent School Health Checks

Periodic school medical examinations in the elementary grades apparently have little, if any, effect on behavior or attitudes toward health care, according to the latest in a series of studies of such examinations in Rochester, N.Y., conducted by Dr. Alfred Yankauer and others.

Although Yankauer avoided a dogmatic assertion that the examinations have no educational value, he did feel it reasonable to state that "any effect of such a program on the health attitudes or behavior of parents and children as a group phenomenon is neither marked nor easily identifiable."

This study and previous ones on casefinding and followup of periodic

examinations at school, Yankauer concluded, "reflect on the indiscriminate overuse of physicians and nurses in elementary schools during the so-called middle years of childhood to examine complete grades of children at frequent intervals." Those who favor such a program must produce objective data of its values to justify their opinions, he added.

To clarify his statements further, Yankauer emphasized that they do not apply to any mass rapid screening program of school children, or to intensive counseling services offered small numbers of selected families, or to school medical and health services for older children.

Yankauer is director of the bureau of maternal and child health, New York State Department of Health. Also participating in this study

pupils who have been unable to obtain a private physician's examination.

The philosophy that "the purpose of physicians and nurses in schools should be educational" evolved in the late 1930's and early 1940's, Kinney pointed out. Under this concept, the school physician is no longer a "searcher for defects"; rather, he is a school medical adviser. The school nurse does not conduct "morning inspections" of hands, wrists, and elbows for scabies, hair for pediculi, or chests for rashes. Instead she is a nurse-teacher, an integral part of the educational team in her school.

Today's school health examination, or health appraisal as some choose to call it, is a cooperative process for determining the total health status of the school-age child, Kinney asserted. Parent, teacher, physician (school and private), nurse, dentist, psychologist, and others all participate. It includes health observation, health inspection, screening tests, and medical examination.

Urges Schools To Launch Model Medical Care

Dr. John D. Porterfield, Deputy Surgeon General of the Public Health Service, urged school health workers to place greater emphasis on the application of health discoveries already at hand.

Addressing members of the American School Health Association, he said: "I appeal to you, as I have to other health workers, to gather the harvest from the rich territory which lies within your jurisdiction."

One substantial reason for the lag in health progress during the past decade, Porterfield believes, is that health workers are trying to change the motivation and attitudes of their clients. This is the most difficult thing in the world to do. Suggesting that health workers might take a hint from the history of industrialization of the western world, he pointed out that in industry "improved practice rather than

a change in human nature is the key to greater productivity."

He described a way in which school health workers might make a significant contribution through making certain, for each school in their community, that every child with a medical condition obtains maximum remedial care. If this were done, he said, we could, in the course of a generation, count on a definite health benefit to the community.

School health workers, of course, would not be able to do this entirely through their own efforts, he pointed out. In most communities the help of a wide range of services would be required.

But these services must be coordinated. A community could certainly improve its health practice, Porterfield declared, if it took stock by means of an inventory of services available, services needed, and services duplicated.

Such an inventory would permit the community to set up its health activities like an industry's production line "with . . . emphasis on what is important and a careful designation of tools by which the health product would be produced," he said.

As an additional benefit of the inventory process, enthusiasm and cooperative relationships would be developed by the producers of the services, whether government agencies, voluntary associations, private physicians, or other health workers.

The inventory could serve also as a double checklist; first, to see whether all needed services are present and, if present, whether in adequate supply; and second, as a basis for analysis of whether the available services are being supplied efficiently or wastefully.

Concerned Teenagers Search for Guidance

The anxieties which shake the soul of a teenager can be brought to light through the friendly interest and unprejudiced competence of an adult, in the opinion of Dr. Arthur Roth, director of the teenage clinic,

Permanente Medical Group, Oakland, Calif.

Teenagers have many concerns, he said. They worry about themselves, their friends, their parents, their brothers and sisters, their communities, and about the state of the world in which they live.

Questions asked at the clinic indicate that teenagers are most concerned about their appearance, their acceptability to others, and their normality, Roth stated. Also, with the realization that the transition to adulthood will bring new challenges and responsibilities, as well as new gratifications, these junior adults worry about their ability and worth.

Although teenagers worry about their health, Roth said, they view preventive health measures with mixed feelings because the majority of the adults around them seldom take advantage of good health practices and because only certain types of individuals possess the strength as well as the intelligence to get an immunizing shot despite the pain and fear of the needle.

Roth suggested that when a teenager is ill he should be given curative and medical care coupled with tolerance and understanding of him as an individual rather than as a case.

Though the concern which the parents show about and for their youngsters is often received with rejection and hostility, the teenager basically appreciates the parent who lets him know what he considers important in the teenager's life.

One of the reasons for turning to their friends rather than to parents or other adults for advice, Roth stated, is that teenagers become worried and tense by the concern of adults. Their friends, however, are too concerned about themselves to worry much about someone else's problems.

Adolescents begin to view death as a real possibility. The ambivalence that every child feels for his parents adds to the child's worries about life and death, knowing that his parents will die and realizing that he will feel guilty if they do, Roth said.

According to Roth, the teenager worries whether his community will offer him the best possible help in

education, in recreation and social programs, and in job opportunities. As for concerns about the world, he said, this teenage generation knows it can be destroyed easily. It is also aware of the many unsolved questions posed in living together as peoples and nations of an entire world.

Thinking teenagers feel that adults do not practice enough of what they preach. Roth believes that teenagers have an impressive love for life and a desire to be useful to others.

Describes Public School Sex Education Program

Urging promotion of social health education, Dr. Gage G. Wetherill, director of health education, San Diego (Calif.) city schools, described the program under his direction.

Stating that he has found general agreement on the need for sex education, Wetherill pointed out that parental consent to take the courses in San Diego's 125 elementary and secondary schools was given for more than 90 percent of the children.

In starting a program, support of key people in the community is essential, Wetherill said, suggesting talks with individuals, PTA meetings, and formation of an advisory committee. He also recommended getting the superintendent of schools and the board of education to approve the plan on an experimental basis and careful selection of teachers. Wetherill particularly emphasized the need of keeping the parents informed and the program close to them.

The night meeting for parents has been very helpful in the San Diego program, Wetherill reported. Parents of all sixth grade pupils are invited to a meeting 2 weeks prior to the lessons, and materials that will be given to the children are reviewed. This lets parents know what is being taught and helps them answer the children's questions. Many parents admit learning some of these things for the first time themselves, he said.

There are many good approaches, Wetherill asserted, and the programs

can vary widely. He noted that most principals prefer to start the program at the end of the sixth grade because of the maturation factor.

Wetherill stressed the importance of directing the program to the interests and needs of the children, distinguishing between the physical emphasis in the elementary school program and the social connotations at the junior high school level. Controversial material, Wetherill said, is omitted from the lessons, and if questions arise, they are referred to the parents.

Committee Coordinates Aid For Disturbed Children

The development of the Coordinating Committee on Rehabilitation of Children and Youth, a multidisciplinary group serving children with behavior problems, was described by Dr. Paul R. Ensign, health officer of the Great Falls (Mont.) City-County Health Department.

The coordinating committee grew out of the health department's efforts to find treatment for children referred as part of the school health program. A sample survey early in the program indicated that teachers wanted help with some 2,000 of the Great Falls school population of 17,000 and that the need was acute for about 300. This number of children would literally swamp the limited facilities usually considered for handling these children, Ensign said.

The facilities Ensign mentioned included a State mental hygiene clinic, private psychiatrists (two full time and one part time), boys' and girls' industrial schools, and a few church schools or children's homes that take children with mild emotional disturbances. There are no residential treatment centers for moderately or severely disturbed children, Ensign noted.

Referral is difficult also, Ensign emphasized, because of the cost of private care, the stigma many of these families attach to going to a psychiatrist, and reluctance of many physicians to take on a heavy caseload of this kind. "Unable to refer these cases, the health department

found itself doing a great deal of counseling and guidance," he said.

For some of the patients, Ensign continued, it was possible to confer with the mental hygiene clinic. At first teachers were invited to these conferences; later, social workers, probation officers, judges, juvenile officers, employment counselors, and guidance counselors from the schools participated.

As a result, the Coordinating Committee on Rehabilitation of Children and Youth was formed, Ensign reported. In addition to the agencies mentioned above, it included representatives from the labor unions, ministerial association, medical society, the YMCA, YWCA, Boy Scouts, and other organizations.

Outgrowths of the coordinating committee include committees for conducting a big brother program, providing jobs, and revising the directory of social agencies. A central index of cases was established, and funds were provided to study the occurrence of preventable factors in emotional disturbances.

The coordinating committee has been incorporated into the Cascade County Community Council as one of its subcommittees on youth. It holds regular monthly meetings but no longer discusses individual cases.

Warning against the use of psychiatric methods by persons not trained to practice them, Ensign observed that nonpsychiatric methods seem to have been used successfully in some cases. Nearly all the vocations represented by the members of the coordinating committee have developed methods suitable for dealing with problems in their own field. By working together and drawing on the skills represented in the group, it is expected that better methods may be discovered to deal with emotionally disturbed children who cannot be seen by psychiatrists.

Tape Recorder Screens For Heart Disease

A device for automated tape recording of heart sounds has been tried for rapid screening of heart disease in a mass field test of approximately 30,000 Chicago school

children, reported Louis deBoer, executive director of the Chicago Heart Association, in collaboration with the program director, Joel Edelman.

Good quality apex and base heart sound recordings can be made from an average of 250 children in a school day, deBoer stated. Physician-readers can listen to the recordings at the rate of 140 per hour, although 2 hours is considered the limit for one listening period.

All children having suspicious heart sounds, deBoer explained, are recalled for a brief clinical examination, in which a physician listens directly to the heart, notes the child's general appearance, and obtains a medical history. A parent must be present at the recall examination, a requirement that provides an opportunity for the physician to explain the findings to the parent. Such explanation, deBoer feels, is one of the most important tasks, and probably the most difficult, of the program.

Children designated for further study after the recall examination are followed in an attempt to establish a documented diagnosis of heart disease.

Evaluation of the 18-month field test is only beginning, but certain preliminary conclusions are apparent, deBoer said.

One, the equipment and methodology have worked effectively under field conditions over a relatively long period and in a large population group.

Two, the public willingly cooperates and appears eager to follow through with recommendations. Participation has approached 90 percent, due partly to sound administrative preparation, deBoer believes, and partly to the technique.

Third, this screening method can find previously undetected heart disease, and it can also lead to reevaluation of children previously labeled cardiacs. This reevaluation deBoer considers a valuable bonus of the screening program. It may permit some children whose activity has been restricted to return to more nearly normal living, he said.

The fourth conclusion, according to deBoer, is that the success of any new program is measurably affected

by the adequacy of planning and educational efforts. All interested community agencies were involved in the screening project through an interagency advisory committee, consisting of representatives of the Public Health Service, the Chicago Board of Education, the Chicago Board of Health, the Chicago Medical Society, and the Chicago Heart Association, deBoer stated.

Findings of Preliminary Tests

In one of several preliminary field studies of the tape recording screening method, 40 of 1,000 children were recalled for physical examination because of suspicious heart sounds, deBoer reported. Of these children, seven were believed to have definite organic heart disease and three others warranted further followup. Five of the seven had no prior knowledge of their heart disorder. These figures compare favorably, he indicated, with those reported in other studies.

As to reliability, sensitivity, and specificity, preliminary tests demonstrated that "heart sound recording has as much (if not more) potential as any other single screening device proposed to date," deBoer said. Data from the mass test suggest a similar conclusion.

Although the outlook is promising, many questions must be answered before a final decision as to the future application of the method can be made, deBoer cautioned. He mentioned questions of cost related to yield and other factors, of applicability to varied community circumstances, and of long-term benefit as reflected in improved health for the children.

Funds and personnel for the mass field test were supplied by the Public Health Service, the Chicago Board of Education, the Chicago Board of Health, and the Chicago Heart Association.

Fantasy in Large Doses Distorts Dental Facts

Rather than set a standard goal for all children, dental health education should aim toward helping each child achieve his own potential for

dental health, according to Elizabeth M. Warner, dental hygiene consultant of the Division of Dental Public Health and Resources, Public Health Service. Uncontrollable factors, such as heredity, socioeconomic level of the family, and availability of dental care, must be considered in appraising a child's dental prospects.

A child wearing orthodontic appliances can hardly compete in such activities as "Best Smile Contests." Citing this as an example of the peril of emphasizing comparison in dental health education programs, Warner suggested an alternative approach: personal recommendations and commendations on improvements, good practices, and successful preventive action.

As examples of suiting information to the audience, she said a simple explanation of what is happening in his mouth interests a 7-year-old, whereas a teenager is more likely interested in appearances.

Even though teaching should be as interesting as possible, Warner said, it should be realistic lest the true meaning of the intended message be lost. Too liberal use of metaphor or fantasy is likely to create confusion in the imaginative minds of young children.

Television commercials for toothpastes, she said, are more likely to be quoted by children as sources of dental health information than are dentists, teachers, parents, or health textbooks. Warner suggested capitalizing on this interest by correcting the misrepresentation of commercial messages. An important goal can be achieved, she said, by teaching children to analyze all health information to which they are exposed, to discriminate between reliable and unreliable sources, and to learn where to obtain accurate, up-to-date facts.

Speaking of the principle that children learn from their environment, Warner pointed out the inconsistency of candy vending machines in the halls of the school which teaches that sweets encourage decay. As for learning from example, the many implications in this principle apply to learning experiences in the home, the school, and in the dental office

or clinic. Also, she cautioned, the personal biases of health teachers about the primary importance of some particular health fact or practice can be misleading and in some instances can result in disregard for more serious problems.

Methods To Find and Teach Children With Eye Defects

The teacher's contributions to eye health were emphasized by Dr. C. Morley Sellery in setting forth a five-point school program. He was formerly director of health education and health services for the city schools in Los Angeles.

A well-trained, observant teacher will detect a high proportion of pupils with visual defects of sufficient severity to cause visual discomfort or serious eye strain, said Sellery. The teacher would refer such pupils to the school nurse or physician for vision screening or, if such services are not available, would inform the parents directly.

Sellery believes there is danger of ascribing to batteries of screening tests a value they do not have and in so doing overlooking or failing to encourage teacher observation.

A related feature of the eye health program, according to Sellery, is a strong unit on eye health as part of the health education program. Instruction should cover care and protection of the eyes, simple anatomy and physiology, types of visual defects, and importance of the eyes in gaining an education, he said.

For adequately trained teachers, Sellery recommended that school districts provide on-the-job training through workshops, institutes, and nurse-teacher conferences, since "teacher-training institutions vary widely in the quality and extent of teacher preparation in these areas."

The eye health program should also include an environment conducive to eye health and optimal visual efficiency, vision screening and referral of children requiring eye care, and special attention to the blind and partially seeing.

Though careful not to overrate vision screening tests, Sellery consid-

ers them important for the detection of "a significant number of cases of visual impairment needing attention that do not present obvious symptoms . . . and could not be detected even by an observant teacher or school nurse." However, he feels that ideally all children should have complete eye examinations by the family eye specialist at least twice before entering school and periodically thereafter.

A careful health history, observation by well-trained teachers, Snellen testing by school nurses, and re-checking of referrals by school physicians when possible would constitute an adequate screening program, Sellery believes. In districts where teacher observation has not been highly developed, use of a plus sphere lens for excessive hyperopia and eye muscle testing for lateral and vertical muscle imbalance are warranted.

Based on the philosophy that handicapped pupils fare better emotionally when they can mingle with physically normal children, some schools now put partially seeing children in regular classrooms, Sellery stated. The regular teacher is given special help by a traveling teacher of the partially seeing.

Prevalent Misconceptions

Discussing more fully the partially seeing child, Katie N. Sibert, teacher-consultant for the schools of Stanislaus County, Calif., issued a plea to combat prevalent misconceptions regarding abilities and needs of visually handicapped children.

Terms such as "sight saving" and "sight conservation," she pointed out, are in direct opposition to the philosophies of authorities in the field of vision. She cited references which state emphatically that use of what vision one has is not harmful. In fact, according to one source, save it long enough and you won't have it to use.

It has also become evident, Sibert declared, that the "visual acuity" of the child often appears to have little bearing on "visual efficiency." Many authorities believe, she said, that intelligence and physical, emotional, and social factors must

be considered together with visual acuity before a true picture of "visual efficiency" can be ascertained.

The aim in working with the partially seeing child, Sibert indicated, is to give him a chance to learn to use the vision he has and to be sure that the child is free to function emotionally, socially, and educationally as well as his native ability will allow.

Another misconception is the belief that all books for the child who is partially seeing must be in large type. Many of these children read regular print easier and faster than they read large print, she said.

Nor is it true, Sibert added, that optical aids and magnification devices will answer the educational needs of all children who are partially seeing.

To illustrate her viewpoint, Sibert described a child technically blind (7/200 and 5/200) who, as a result of cooperative planning and work of many people, is able to function satisfactorily in a regular school.

Self-Evaluation Possible Without Hypochondria

Health instruction for college students does not seem to foster "hypochondriasis," concluded Dr. Charles E. Richardson from a before-and-after study of 235 students enrolled in "Healthful Living," a basic college health education course. He is assistant professor of health education, Southern Illinois University, Carbondale.

Three tests were given during the first and last weeks of the course, two Minnesota Multiphasic Personality Inventory tests (one a "lie" index and the other a hypochondriasis scale) and the Harrower Multiple Choice Test (Rorschach group test).

Scores on the MMPI hypochondriasis test were slightly higher after the instruction, Richardson said, but still well within normal range. Scores on the Rorschach test, however, were significantly lower after the course, an interesting finding but hardly conclusive, he indicated.

Low correlations between the scores on these two tests indicate minimal if any relationship in factors being measured even though each test is purported to be a valid indicator of hypochondriacal tendencies, Richardson stated.

Scores on the MMPI "lie" test were also significantly lower after the course. This finding, he suggested, may point to the attractive hypothesis that health instruction encourages more valid and reliable self-evaluation.

The 15 items on the "lie" test present situations socially desirable, but rarely true. The mean raw score for most normal groups is between 3 and 5; for this group it was more than 6 before the course and less than 4 after.

Citing a popular report which suggested that hypochondriasis is increasing, Richardson advocated comprehensive studies of the relationship between health interest, health concern, and hypochondriasis, with special emphasis on analysis of measurement techniques.

Health Textbooks Slight Positive Aspects

High school textbooks on health emphasize structure and function of the body and diseases and disorders, according to an item and word count, reported Dr. Margaret Greenslade, assistant professor of health education, San Fernando Valley State College, Northridge, Calif.

These two areas (of 13 listed) include one-half of all the health information in the nine textbooks analyzed in her doctoral dissertation.

Little attention was given to food needs of the body, mental health and mental illness, personal care of the body, official and voluntary public health, and preparation for family living. In one book, however, one-third of the items listed were devoted to preparation for family living.

Misconceptions about health, importance of activity and rest, community health services and facilities, and medical advances for health were least emphasized, Greenslade said.

Seven-eighths of the words counted pertained to health information, and one-eighth dealt with such other material as safety, first aid, physical education, and vocations.

On the basis of this study, Greenslade recommended that:

- Schools provide several health textbooks so that students may have access to the broad scope of health information.
- Authors of health textbooks consult qualified educators and professional medical personnel for recommended health topics, particularly in mental health and family living.

Food and Nutrition . . .

Food Code Fitted For the 1960's

A model food ordinance soon to replace the "Ordinance and Code Regulating Eating and Drinking Establishments—1943 Recommendations of the Public Health Service" will reflect new approaches and broadened participation in its formulation in addition to the latest developments in food technology, according to William V. Hickey, one of the 16 members of the Public Health Service Food Establishment Sanitation Advisory Committee.

The advisory committee, composed of representatives of national public health and sanitation organizations, State and local health departments, the food and beverage industries, and educational institutions, began the task of formulating the new food document more than 3 years ago.

Hickey reported a primary aim of the committee was to adopt an educational approach stressing "good daily practices, proper use of equipment, approved methods, and more enlightened food service operators and employees."

In addition to the usual model code and ordinance recommended for legal adoption by State and local governing bodies, the new document will offer supplementary information for those enforcing and those complying

- Information on voluntary health agencies and other educational and professional groups be increased.
- Credit be given to physicians, inventors, or scientists making discoveries mentioned.
- Wellness rather than illness be emphasized in discussions of diseases and disorders.
- Textbooks aid students in developing desirable attitudes toward information received through mass media.
- Greater emphasis be given to health topics associated with the space age and other scientific health advances.

with the recommended regulations. Hickey said the document in its entirety is intended as an "informative, educational tool for the sanitarian, the food service operator, and the foodhandler."

Sees Optimum Nutrition As Home Care Goal

Assisting each patient to achieve and maintain the diet best suited to his individual needs with the least difficulty to himself and his family was proposed by Mildred Kaufman, nutritional consultant, Chronic Disease Branch, Public Health Service, as a nutritional objective for home care, homemaker, and other home services to the chronically ill.

Questioning how much nutrition service is currently offered patients even in comprehensive home care programs, Kaufman cited reports showing the use of nutrition services varies widely in existing programs.

Of 37 home care programs recently surveyed by the Public Health Service, none maintained a full-time nutritionist as part of the regular staff, 34 programs had part-time nutrition services available from within the administering or a cooperating agency, and 3 programs offered no nutrition service, Kaufman reported.

Other recent studies of home care

programs show 1.7 percent of the patients in 19 New York City programs received the services of a dietitian; in the Detroit program, 18 percent of the 70 patients discharged in 1957 used diet therapy; and nutrition consultation was provided to 36 percent of the 901 patients treated under Philadelphia's home care program during the decade 1949-59, though the percentage of patients who received this service in the year 1957-58 rose to 49.

Observing that research has yet to answer many questions concerning nutrition's relation to the chronic diseases, Kaufman maintained that application of existing knowledge of nutrition can contribute to the well-being and therapy of the long-term patient. She urged health workers engaged in all aspects of home care to work together to determine the most effective ways of using professionally trained nutritionists to provide patients in home care programs with the services they need.

Findings of a Public Health Service survey in 1958 show that 83 percent of nearly 2,200 families receiving homemaker services had an ill member of the household; that meals were prepared and served by the homemakers in 71 percent of these families; and that homemakers planned the meals for 46 percent, and prepared and served special food for one family member in 13 percent of the families.

The homemaker is more effective in the job she is performing if she has some training in basic nutrition, meal planning, and in the preparation of therapeutic diets, Kaufman said. In addition, if the homemaker who plans or prepares meals is aware of the emotional and social aspects of eating, she will respect and follow a family's normal eating habits as much as possible. Kaufman also recommended that, as a part of on-the-job training, the homemaker be given individual consultation in preparing a specific therapeutic diet when the need for it arises in the family for whom she is working.

Kaufman mentioned meals-on-wheels service as an additional resource in some areas for providing food to patients at home. She pointed out, however, that very few

existing programs of this kind provide therapeutic diets prepared under the supervision of a dietitian or nutritionist.

Breast Feeding Assures Linoleic Acid Adequacy

The significance of linoleic acid in the infant's diet is reemphasized by preliminary observations from a study of 30 healthy pregnant women and their offspring, according to Dr. Arild E. Hansen, director of research, and Dr. Hilda F. Wiese of the Bruce Lyon Memorial Research Laboratory, Children's Hospital of East Bay, Oakland, Calif.

Hansen and Wiese described the study, which was carried out at the University of Texas Medical School in Galveston and at Tulane University Medical School and Charity Hospital in New Orleans, as an effort to obtain facts pertinent to this question: Is the infant's chance of developing linoleic acid deficiency dependent on the nature of his diet during early life, or is it influenced by his mother's diet during pregnancy?

From the study data evaluated so far, the authors concluded that when linoleic acid comprises from 1.5 to 7 percent of the calories during the third trimester of pregnancy, the mother's intake of linoleic acid appears to have little influence on the diene fatty acid level in the blood serum of the newborn infant. They observed, however, that it is still to be determined whether a strict exclusion or a high intake of linoleic acid during the latter part of pregnancy influences the offspring's proclivity to develop linoleic acid deficiency.

Referring to the evidence that the amount of linoleic acid in the infant's diet does have great influence on his susceptibility to development of linoleic acid deficiency, Hansen and Wiese added: "The natural diet of the newly born infant contains liberal amounts of linoleic acid. Inasmuch as breast milk usually comprises from 3 to 5 percent of the caloric intake as linoleic acid, it would appear that the prevention of fat deficiency is

assured if the infant is breast fed providing the nursing mother's diet is adequate."

Dietary deficiency of linoleic acid is readily reflected in the level of dienoic acid in the blood serum, the authors maintained. Clinical manifestations in infants include general skin dryness, thickening, and scaling and raw, reddened irritation of the buttocks and the skin in the body folds. Signs of the deficiency can occur as early as 3 to 4 weeks after birth in infants given milk mixtures lacking in linoleic acid, whereas addition to the diet of linoleic acid in the form of an ester or triglyceride results in the disappearance of abnormal skin symptoms in a week or two.

Hansen and Wiese presented a comparison of the linoleic acid intake from five different milk mixtures used as infant diets based on the finding that the level of diene fatty acids in the blood serum of infants 4 to 8 weeks old reflects the linoleic acid intake from diet. Rated as percentages of the total fatty acids in the serum, the diene fatty acids constituted 5 percent or less in infants fed on a milk mixture practically devoid of fat; 10 percent in infants receiving an evaporated milk formula; over 10 percent in infants fed evaporated milk plus breast milk; 20.5 percent in infants on breast milk alone; and between 26.8 and 32.4 percent in infants given a milk formula containing vegetable oils that provided about 7 percent of the caloric intake as linoleic acid.

Samples Score Georgia's Food Service Sanitation

Success in Georgia's first attempt at statewide evaluation of food service sanitation through use of statistical sampling procedures was reported by Louva G. Lenert, director of the division of public health engineering service, Georgia Department of Public Health.

Lenert said the sample study was undertaken early in 1960 as an economical, rapid, and reliable means of appraising accomplishments 1 year after the effective date for

State board of health regulation of food service establishment sanitation throughout the State. He credited public health statisticians with designing a study yielding a single State score from inspections of 400 food establishments in 23 of Georgia's 159 counties.

Study findings scored the State at 79.69, counties with populations of less than 10,000 at 77.84, and counties with populations of more than 50,000 at 80.14. Though a county's size had little effect on scores, Lenert pointed out, scores improved as the size of establishments increased. Thus establishments serving fewer than 26 persons a day scored 63.49, while the score for establishments serving more than 500 persons daily was 81.92.

For the State as a whole, the items most commonly linked with sanitary defects were floors and toilets among structural facilities, utensil construction, cleaning of equipment, storage and handling of utensils, and handling of wastes. Lenert reported a general trend showing a decline in sanitary violations for specific items as the size of establishment increased. The one exception to the trend, he said, was observed in storage of food and drink, which showed that violations increased with the number of persons served daily.

Poisonings by Fish Need Systematic Study

Calling for coordination of the epidemiological, biochemical, and biological approaches, Dr. Alfred F. Bartsch and Earl F. McFarren of the Sanitary Engineering Center, Public Health Service, outlined a plan for intensive and long-range studies of poisoning caused by ingestion of intrinsically toxic fin fish.

Bartsch and McFarren, who participated in an exploratory survey of fish poisoning in the Marshall Islands in 1958, made six principal study recommendations:

1. A system for collection and analysis of epidemiological data should be devised to observe incidence trends and establish more clearly the relationship of symp-

toms with species of fishes involved, their origin and environment, and the mode of handling them after catching.

- At present, the authors said, considerable confusion surrounds the relationship of potentially toxic fishes to illness in humans. There has been no systematic analysis of large numbers of cases to indicate the varieties of poisoning. As human symptoms may be numerous and varied, the authors stressed the value of a controlled analysis of clinical observations relating them to fish species and laboratory studies. Fish poisoning incidence trends also should be evaluated in relation to weather, water characteristics, and other environmental phenomena in an effort to detect significant influences.

2. A phase of study should be devoted to developing more effective therapy for victims of fish poisoning. Current treatment is only symptomatic and employs a wide range of medications.

3. A simple on-the-spot test should be developed to determine whether a fish is safe to eat and to relate the quantity of poison present in a fish to the quantity that will cause human illness.

4. Pharmacological studies are needed to determine the physiological response of test animals to fish toxins to provide for a more rational approach to diagnosis and therapy and a better understanding of the biological activity of fish toxins. Such studies will require large quantities of poisonous fish material and will pose collection difficulties.

5. To obtain toxic fish specimens for study, advantage should be taken of the normally occurring fish poisoning episodes among the inhabitants of the Marshall Islands and other populations in poisonous fish areas. In addition, a systematic procedure should be developed for acquiring all of the following types of information when an episode occurs; symptoms occurring in humans, details of the causative fish's environment, symptoms occurring in laboratory animals fed a part of the same specimen used for other analyses, and human patient responses to a given therapy.

The general procedure in past studies has been to collect hundreds of fishes and to test all of them for toxicity by assay. Such costly and time-consuming effort to obtain one or two toxic specimens is exceedingly inefficient, according to the authors, who maintained that the information obtained in this way can only relate toxicity to the response in test animals and fails to provide the more important knowledge of human symptoms in response to the toxin of a specific fish.

6. Ecologic study is proposed to determine if there is some dependable relationship between one or more identifiable variables in the environment and the appearance of toxic fishes.

Though no way is known to predict toxicity in fishes at a given locality, the formation of toxins appears to be a response to some influence in the environment and perhaps involves feeding habits and susceptibility of fish species. If relationships between environment and appearance of toxic fishes are discovered, Bartsch and McFarren suggested, poisoning episodes might be prevented by avoiding susceptible groups of fishes or by controlling the causes of toxicity.

Zero Fahrenheit Protects Frozen Food Products

If frozen foods were always kept in an environment at zero degrees or lower, or if necessary excursions to moderately higher temperatures were always kept short, there would be no material quality loss during distribution, said Dr. M. J. Copley, director of the Western Utilization Research and Development Division, U.S. Department of Agriculture, in a paper describing time-temperature effects on frozen foods and summarizing the extensive microbiological literature dealing with these foods.

Copley stated that even though frozen foods remain entirely wholesome when kept at 10° or 20° F., deterioration in flavor or color soon destroys the sales attractiveness. Industry surveys have found such temperatures do exist in some dis-

tribution facilities, and if the times are long enough the food quality suffers. The rate at which quality loss occurs increases as temperature goes up. Even at 20°, well below the freezing point, flavor quality of the food may be lost 30 to 40 times as fast as at 0°, he said.

Pointing out that freezing does not eliminate bacteria, Copley said that 40° and 14° F. are especially significant limiting temperatures. Below 40°, no food poisoning or pathogenic organism has been reported either to grow or to produce toxin, and many of these organisms cannot grow below 50°. A temperature of 14° F., according to most authorities, is the lowest at which growth of any micro-organism is known to take place.

Between 14° and 40° bacterial activity is possible and in the higher part of this range the cold-tolerant organisms can readily multiply. Copley reported studies of frozen vegetables that detected bacterial growth in samples stored at 25° or higher. No growth was detected in samples maintained at temperatures lower than about 20°. He also pointed out that at 25° and above

the off-flavor due to chemical changes was detected before the bacterial population had increased materially.

Copley listed such quality defects as brown color in sliced peaches, pale strawberries, olive-drab string beans, rancid chicken or turkey, curdled gravy, and the like, as the results of physical and chemical changes that take place in all frozen foods—very slowly at zero degrees, more rapidly at higher temperatures. The changes are additive, so that an accumulation of minor changes will eventually amount to a serious loss of consumer appeal.

To illustrate what he described as the sensitivity to a small rise in temperature of some frozen products, Copley cited the behavior of sliced strawberries in retail cartons. When this product is maintained at a constant temperature of 0° F., a panel of trained tasters can first detect a perceptible change in flavor and color in about 1 year. The identical change takes place in about 65 days at 10°, in about 10 days at 20°, and in about 3 days at 30° F. In this case, he observed, a rise of only 30° in temperature speeds the loss of flavor and color 120-fold.

available by the pharmaceutical industry.

Plant extracts have produced important temporary effects against choriocarcinoma which had become resistant to other forms of treatment and against acute monocytic leukemia, Hodgkin's disease, neuroblastoma, and other solid tumors in man.

The deleterious effect of many anticancer agents is well known. The major need is a means of detoxifying these chemicals or finding anticancer agents without toxicity, Farber said.

The laboratory use, and eventual clinical use of bone marrow transfusion, has aroused interest in many countries in the last few years. Tests have proved that bone marrow may be removed from a patient and returned by transfusion to the same patient a few hours after administration of larger than usual therapeutic doses of anticancer chemicals, or even reinfused weeks or months later after suitable preservation in a frozen state. A solution to the challenge of collecting, preserving, and using homologous bone marrow would markedly improve the effectiveness of carcinolytic agents, Farber continued. Drug resistance on the part of the tumor or the occurrence of toxicity from high tumor-destroying doses of a drug act as limitations for successful treatment.

The addition of chemotherapy to surgery and radiotherapy in 1947 was based on the assumption that chemical agents which might not destroy a large tumor mass might destroy small numbers of circulating cells or small tumor metastases. The policy was based also on the assumption that more effective anticancer agents would become available and could improve therapeutic results produced by surgery or radiotherapy alone, Farber said. This plan anticipated the possibility of chemical agents operating upon an inoperable tumor in such a way as to make it operable and included the possibility that radio-insensitive tumors might be made sensitive by chemical reaction. Cancer chemotherapy has realized both of these goals, Farber reported.

In the past 4 years, 39 university surgery departments and 31 surgical

Epidemiology . . .

Chemotherapy Aids Cancer Treatment

If cancer is caused by a virus acting by virtue of its chemical content and structure or by a chemical associated with a virus outside or inside the body, chemotherapy should be ideal for the correction of any intracellular chemical abnormality, suggested Dr. Sidney Farber, professor of pathology, Harvard Medical School, at the Children's Hospital, and director of research, the Children's Cancer Research Foundation, Boston, Mass.

Effective treatment would require the recognition of such a biochemical disorder by means of a quick diagnostic test which could be carried out on a mass basis. Though neither chemotherapy nor diagnosis is as

yet satisfactory, he said, research has scored impressive progress.

The last 20 years have seen the realization of the destruction of cancer in man by chemical substances introduced into the human body: the female sex hormone in the treatment of cancer of the prostate; testosterone in treatment of breast cancer; nitrogen mustard in patients with Hodgkin's disease; and the folic acid antagonist, aminopterin, the first antimetabolite, in acute leukemia in children, Farber pointed out.

Under actual clinical study in co-operative programs in many parts of the country are 78 new chemical agents gleaned from the study of many thousands of chemical compounds and new antibiotics and also 78 synthetic hormone analogs made

divisions in Veterans Administration hospitals have cooperated in clinical studies to evaluate the use of chemotherapy begun at the time of surgical excision of tumors of the colon, stomach, lung, breast, and ovary. Data gathered from the several institutions point to the superiority of the combined use of radiotherapy and chemotherapy. In postoperative treatment, after completion of radiotherapy, chemotherapy is continued and further courses are given at intervals which are decided upon by the return of the bone marrow and peripheral blood to a normal state. If we assume, Farber said, that metastases are present at the time of diagnosis of a solid tumor, a chemical agent should be added as soon as the diagnosis is made and its use should be continued during operative procedure and subsequent radiotherapy and after both of these forms of treatment have been completed. The length of treatment, Farber warned, must be determined by carefully controlled and designed studies.

With cancer chemotherapy recognized as an accomplished fact, the final need, Farber said, is an increase in the number of diagnostic and therapeutic cancer institutions where expert diagnostic work and clinical investigation can be carried on.

The final goal of cancer chemotherapy, Farber concluded, is not the mere amelioration of symptoms or simple increase in months or years of survival, but the control, prevention, and eventual eradication of the many diseases grouped under the word "cancer."

Histoplasmosis Epidemic Attributed to Starlings

An epidemic of histoplasmosis among Boy Scouts who helped clean up a park in Mexico, Mo., is attributed to contact with soil contaminated by starling excreta in a report by Dr. M. L. Furcolow, medical director of the Kansas City Field Station of the Communicable Disease Center, Public Health Service.

Co-authors of the report are Dr. F. E. Tosh, Dr. H. W. Larsh, and Dr. H. J. Lynch, Jr., of the field sta-

tion, and Dr. G. Shaw, pathologist at Audrain County Hospital in Mexico.

Although Mexico is in a highly endemic area, the epidemic was clearly defined, Furcolow reported. A group of 64 Scouts raked leaves and debris in the park on March 28, 1959. Within 2 weeks 10 of them developed clinical symptoms ranging from moderately severe illness to mild upper respiratory infection. Ninety-seven percent of the entire group had positive histoplasmin skin tests, 60 percent had positive complement fixation tests, and 47 percent had abnormal chest X-rays.

Conditions in the park favored the growth of fungi. The property, first a plantation and then untended pasture land, was a jungle of underbrush shaded by tall trees before clearance started in 1958. Leaves and debris were several inches thick. Thousands of starlings roosted in the place from 1950 until 1955, when eradication began. Their droppings covered the ground.

Histoplasma capsulatum was isolated from 36 (62 percent) of 58 soil samples collected in May, July, and September from all sections of the park. Most of the positive soil samples were found in the southeastern section, where most of the droppings remained and where the four Scouts with the severest cases had worked. But three isolations were obtained from the southwestern and four from the northeastern sections. This many widely distributed isolations leaves little doubt that the fungus was flourishing abundantly throughout most of the park site, Furcolow said.

Tests of soil samples collected in the city and within a 3-mile radius from areas similarly shaded and along streams, but without excessive bird droppings, clearly indicated that soil contamination was mainly limited to the park area. Only 1 of 68 samples yielded *H. capsulatum*.

The Mexico epidemic adds to the evidence that city residents acquire histoplasmosis by contact with soil harboring the fungus and not by casual inhalation of windborne spores disseminated throughout the city, Furcolow concluded.

It is also the fourth reported epi-

demic occurring after contact with soil in an open urban area. Three other distinct sources that have emerged for city dwellers are visits to farms or prior rural residence, exposure to imported farm soil or manure contaminated with bird droppings, usually chicken, and exposure to urban structures frequented by birds.

Furcolow postulates that starlings and other gregarious birds which frequent cities may create sites of florid fungus growth in areas of either high or low prevalence.

California Phenylketonurics Screened and Treated

The challenge of identifying children with phenylketonuria early enough to begin treatment before the brain is damaged faces public health officials today, asserted Dr. Richard Koch of Children's Hospital and the department of pediatrics of the University of Southern California in Los Angeles.

In California two population samples were tested for PKU to establish incidence of the disease: one in training classes sponsored by parent groups for retarded children and another in a selected school population in San Diego County. The tests were conducted under the direction of a registered nurse or through facilities of health departments of the State.

Out of 991 children in 19 training classes, Koch reported, 5 new and previously unidentified cases were discovered and 6 previously diagnosed cases were reported. Of 3,323 children enrolled in special classes and other programs, 81.9 percent were tested. Of the five children with PKU found in this screening, one had been previously diagnosed and was under partial dietary management; two were enrolled in a private school; two in classes for the severely mentally retarded; and one in an elementary class for the educable mentally retarded.

It is estimated from surveys of institutionalized defectives, training classes for retarded children, public school special educational facilities, and the normal population that

California has at least 200 phenylketonurics. Because of the drastic effect of this disease, he said, it is imperative that financial limitations of a family do not bar diagnosis and prompt dietary treatment. To find out how many children needed financial assistance, a project, sponsored by the Children's Bureau, was initiated at the Children's Hospital of Los Angeles. Only children in which the disease had been diagnosed and treated prior to 3 years of age are eligible to receive aid for needy families provided by the project. Other requirements are that the diagnosis must be established by serum phenylalanine determination; a developmental evaluation or psychometric examination must be available and performed annually while on the diet; serum phenylalanine levels are to be determined every 3 months; a statement of need must be supplied by the family physician; and the child must be under continued surveillance by the family doctor.

There is acute need for continued search to identify victims of this disease to enable early diagnosis in subsequent afflicted children yet to be born in these families, concluded Koch.

Co-authors are Dr. Robert Henderson, consultant in education of the mentally retarded of the California State Department of Education; Dr. Willard Centerwall of the College of Medical Evangelists at Los Angeles; and Betty Graliker, social worker with the child development project at Children's Hospital, Los Angeles.

Susceptible Kindred Studied For Early Glaucoma Clues

Four universities, Johns Hopkins, Washington, Iowa State, and California, are collaborating in a study of glaucoma incidence and development in blood relatives of known glaucoma patients, Dr. Robert N. Shaffer, associate professor of ophthalmology, University of California Medical School, San Francisco, reported.

The study, sponsored by the Public

Health Service, is seeking the most efficient way of finding glaucoma before material damage occurs.

Chronic open-angle glaucoma eludes detection because of its symptom-free progress until the late stages, so the true prevalence is not known. But it is estimated that there are more than a million undiagnosed cases in the United States.

Screening the entire population would be a Herculean task with limited casefinding, Shaffer said. Since a single tension reading will find an elevated intraocular pressure in only 39 percent of a population known to have glaucoma, he suggested that more than half of the glaucomas might escape recognition in a mass screening program. Attempts to add tonometry to routine physical examinations have been unsuccessful.

It is now believed that glaucoma is genetically determined, usually of dominant transmission but incomplete in penetrance and expression. A high incidence of tonographic values is found in families of known glaucoma patients. The disease is also most common in persons over 40 years old.

All of these factors suggest that efforts should concentrate on the most susceptible groups, Shaffer said.

Subjects of the collaborative study include three groups: patients with glaucoma sufficiently advanced to have typical field defects; the index patients' parents, siblings, and children; and a control group without suspected glaucoma or other ocular disease.

Each group is given an intensive examination, including the eliciting of a thorough history and use of the most refined techniques for glaucoma diagnosis. The examination will be repeated each year for at least 5 years.

Carefully written protocol and frequent visits to other facilities are expected to minimize variations in technique, Shaffer said.

It is hoped that the study will further elucidate the natural progress of glaucoma and show whether present concepts are correct, Shaffer concluded. By reviewing the early history and the initial responses to the various tests in persons who have

developed clinical glaucoma, it should be possible to determine which phase in the development and which tests offer the earliest opportunity to detect preclinical glaucoma. It should help those working in preventive medicine to know the most efficient way of finding potential glaucoma patients, and it should help ophthalmologists to know which tests are the most reliable.

Suggests Prenatal Agents Cause Childhood Cancer

One of the imponderables in the history of cancer is why there are so many differences between childhood and adult cancer, Dr. Sigismund Peller of New York City said. None of the present-day cancer theories answers this question.

Particularly characteristic of childhood cancer are eye, adrenal, and kidney tumors, and a high ratio of sarcomas and leukemia.

The approximate childhood-adult ratios of various forms of cancer are:

Gastrointestinal.....	1:3,000
Respiratory organs.....	1:1,200
Buccopharyngeal cavity....	1:315
Cerebrum and eye.....	1:10
Leukemia.....	1:5
Cerebellum.....	1:1

The sarcoma-carcinoma ratio is reversed: sarcomas being predominant in children, carcinomas in adults.

The basic proposition, Peller stated, is that cancer in children is a response to exogenous cancerogens acting prior to birth. Assuming this premise to be correct, he continued, three conclusions are possible: cancerogens enter the fetus mainly from the mother's blood via placenta and umbilical veins; the blood of the umbilical veins also carries cancerogens; and, by distributing these substances within the fetal body, the fetal circulation determines the distribution of childhood cancers by tissue, system, organ, region of the body, and time of manifestation.

Cancer of the brain, eyes, calvarium, mouth, jaw, lymph nodes of the neck, and thyroid occurs eight times as frequently in children as

cancer of the esophagus, gastrointestinal tract, liver, pancreas, lungs, and skin. In adults, however, this ratio is reversed to 1:7. Six percent of all children's cancer is in the kidneys, which develop 20 times as many cancers as the bladder. In young adults, 15 to 29 years of age, the ratio is reversed to 6:31, Peller pointed out.

Childhood cancers due to prenatal X-rays have an organ distribution deviating from the norm (less leukemias and lymphosarcomas), for this agent travels straight, independent of fetal circulation.

If the essential for childhood cancer is the amount of cancerogens delivered during the fetal period to respective organs, prevention must begin before gestation, concluded Peller.

Vets Find Dairy Hands Exposed to Nocardia

Recognition of nocardial mastitis in dairy cattle in four States and Hawaii since 1957 led to intensive tests for possible transmission to man of the agent in milk, according to Dr. A. C. Pier and Dr. J. B. Enright, School of Veterinary Medicine, University of California in Davis.

The possibility that infection will result from the aspiration of nocardia-laden milk has been established and supports the theory that the lungs are the most probable organs for primary infection. Previous reports also indicated that injured teeth and gums may serve as portals of entry, Pier and Enright said.

The important factors considered in the tests were the oral infectivity of the organism, *Nocardia asteroides*, and its susceptibility to pasteurization. Oral transmission tests were made on swine, calves, and guinea pigs over a period of several months with milk from infected cows. Comparatively high numbers of *N. asteroides* in raw milk from infected udders are susceptible to current pasteurization methods, and it appears unlikely that oral consumption of commercially processed milk leads to infection, Pier and Enright reported.

As there are indications of high

virulence in some of the bovine isolates, those handling infected animals should use precautions against self-contamination, the authors warned. They condemned the practice of consuming raw milk from infected herds and recommended the slaughter of animals known to be infected.

Pilot Strep Control Proves of Value

A pilot streptococcal control program in Brookline, Mass., has proved the value of public health education administered by research personnel, executed by the private practitioner, and ultimately directed toward the treatment and prevention of a common infectious disease and its sequelae, according to Dr. Joseph M. Miller, Dr. Maurice M. Osborne, Jr., and Dr. Eli A. Friedman of Boston.

Dr. Miller is associate in medicine, and Dr. Friedman resident in medicine at Peter Bent Brigham Hospital. Dr. Osborne is former director of child health in Brookline.

The program was originally initiated to establish a progressive basis for expanding knowledge of streptococcal disease incidence, transmission, and complications in a civilian population under endemic and epidemic conditions. The facilities and personnel of a university teaching hospital, a local health department, and a team of 22 private doctors were coordinated to accomplish this objective.

The doctors participated in the primary casefinding. Throat culture kits contained a report form for the physician's diagnosis of possible streptococcal etiology¹ of the illness, and 10 drugstore depots acted as collection stations for these kits. Positive cultures were reported by telephone daily.

After 48 hours of penicillin therapy, secondary throat cultures of family contacts were made by the private physician or, with his permission, by a public health nurse. Treatment consisted of oral penicillin given for 10 days or a single in-

jection of benzathine penicillin G. Seventeen to 20 days after the original positive culture, and 7 to 10 days after completion of the 10-day therapeutic course of oral penicillin, a followup throat culture was done. All isolated streptococci were grouped and typed. The 17-day followup included urinalysis with sedimentation examination. Thirty days after initial bacteriological isolation a chest X-ray and electrocardiogram were used to check for heart disease. When possible, immune response was studied by anti-streptolysin-O determination.

Other objectives of the program, the authors reported, were:

- Determine the clinical accuracy of physicians in diagnosing streptococcal infection for the purpose of assessing the need for a public health throat culture service.
- Measure secondary attack rates as a basis for evaluating "blind" chemoprophylaxis of family contacts.
- Evaluate the causes of treatment failures despite acute streptococcal sensitivity to penicillin.
- Seek nonsuppurative sequelae.
- Evaluate factors which may influence infection under nonepidemic community conditions and the effects of epidemic conditions on these factors.

This pilot program, concluded the doctors, has demonstrated how a practical and service-oriented public health program can be integrated with private practice toward an epidemiological research objective.

Breeze From Offal Carries Q Fever

A Q fever outbreak in an industrial-residential area in the environs of San Francisco was traced to widespread airborne dissemination of *Coxiella burnetii*, according to Clyde E. Wellock, student at the University of California Medical School, and D. Milton F. Parker, health officer of El Dorado County.

The 51 persons with Q fever were heterogeneous with respect to occupation, social activities, food consumed, and trips taken outside of

their neighborhood. The only common denominator, the authors found, was residence or employment within a radius of 7 to 10 miles from a fat-rendering plant. The raw material processed was offal from cattle or sheep.

The disease appeared during the summer of 1959 when the prevailing

wind, ranging daily from 5 to 15 knots, was blowing from the plant toward the patients' homes or places of business.

Physical examinations revealed no cases of Q fever among the 42 persons working at this plant. Random testing of persons living or working in places outside the path

of the prevailing winds showed no incidence of the fever. Additional tests and surveys eliminated the possibility of other sources of infection and proved, according to Wellock and Parker, that the causative organisms in the California outbreak were carried at least 7 miles by the wind.

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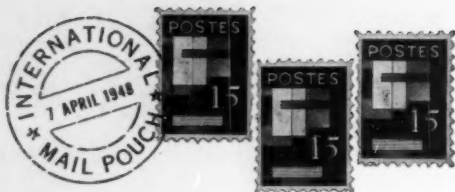
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Well Drillers Seminar

The community water supply project in the Philippines, in process for 7 years, is being reappraised as the result of a seminar on well drilling. During the 6-week seminar sessions, four drill rigs, operating as a team with adequate crews and auxiliary equipment, drilled 10 times the number of wells as the country's monthly average.

The seminar was conducted by the U.S. Operations Mission and the National Waterworks and Sewerage Authority, with sessions for 50 trainees each in Luzon, the Visayas, and Mindanao. Although personnel and geological formations were different in each location, 50 wells, 4 and 6 inches in diameter and averaging 130 feet in depth, were drilled during each seminar session.

The work of the four drill rigs, operated as a unit, was so organized that each crew drilled and cased a well and moved the rig to a new well. Developing, test pumping, grouting, disinfection, concreting, and pump setting were done progressively by separate crews.

Equipment consisted of one rotary rig, a Failing 1500, a Star 55, one percussion rig, a percussion-jet, a second Star 55 with jetting attachments, and an Acker light-duty driving winch, all truck mounted. Auxiliary equipment included a 315 cfm compressor for developing, a concrete mixer, a grouting outfit, five 400 gpm water tank trailers, and test pumps, all truck mounted, and a machine shop. Jetting was more effective than either rotary or percussion drilling in certain formations such as clays, sands, and quicksands.

The performance of the driving winch was promising. The winch, a standard one used by the authority, is a handpowered jet rig mechanized with a gasoline-driven pump and a light-duty cargo winch. However, a larger pump and heavier winch were found necessary when drilling a 4-inch hole below 100 feet.

The mission is planning countrywide tests, using 16 jet rigs equipped with heavy-duty driving

winches, and has acquired some 55 gpm pumps for testing jetting with the handpowered rig. Possibly an effective rig can be devised for about \$2,000, by using a 3-inch G.I. pipe mast and 2-inch jetting pipe.

In a country like the Philippines, where there is an urgent demand for tens of thousands of village wells, organized task forces with auxiliary equipment as well as drilling machines are needed for each province. Drill rigs could be mostly locally fabricated jet rigs with one or two standard, commercially manufactured machines for coping with boulders or drilling larger waterworks wells.

—I. J. SILVERSTONE, *sanitary engineer, U.S. Operations Mission, Republic of the Philippines.*

The Formosan Air

The air over Taipei, Formosa, grows more polluted. Soft coal burning has increased from 7,000 to 15,000 tons each year since 1950, excluding the amount the military and the railroad use. The quantity of other fuels burned, such as wood, is also increasing. Dust, up to 115 tons per square mile per month, rains on Taipei, and sulfur dioxide and organic sulfates in the air are increasing at an alarming rate.

—WALTER S. SHURKIN, *industrial hygiene adviser, U.S. Operations Mission, Taiwan.*

Trachoma in Libya

In one small area of Libya 30 percent of the population have eye pathologies, the majority of them trachoma, and in another, the local physician stated that 80 percent of the children in elementary school have eye infections. The trachoma control teams are emphasizing health information and treatment among the school children.

Some 69 schools receive trachoma control services and nearly 26,000 students have been treated for trachoma and other eye infections.

In one month a trachoma control team visited 7 schools, examined 2,556 students, and treated 868 for trachoma. At the eye clinics at Zavia and Suk El Giuma they examined 153 persons, treated 124 for trachoma, and performed 27 operations for trachoma sequellae.

—HILDRUS A. POINDEXTER, M.D., *chief, Health and Sanitation Division, U.S. Operations Mission, Libya.*

The Teaching of Environmental Health

HERBERT M. BOSCH, M.P.H.

SINCE the challenges of the environment have undergone sharp changes both quantitatively and qualitatively within the past few years, a review of the teaching of environmental health at this time is particularly appropriate. Environmental health deals with the impact of the physical, biological, and social environment on man and the adjustments and control of the external factors to promote his health and well-being. From 1900 until recently, environmental control by public health agencies focused mainly on communicable and infectious disease, and succeeded in the United States and Canada in completely controlling if not eradicating many communicable diseases, such as typhoid fever and malaria. These achievements were based largely on the development of safe water supplies and sewerage, milk and food sanitation, and the control of vectors, techniques that were learned well by students of environmental health in our schools.

Since World War II, the numbers, quantities, and uses of industrial chemicals have multiplied, and a virtually new hazard, radiation, has posed an implacable challenge. The volume and speed of traffic and commerce also have abruptly converted a landscape of sleepy, self-centered villages into a whirling megalopolis, invaded by habits, ideas, and parasites from all ends of the earth. The heightened level of consumption has also accentuated the physical hazards of glare, noise, obesity, congestion, heat, and violence.

Today, schools of public health have a duty to orient all persons toward these new problems

of the environment and in addition to assume part of the task of preparing highly qualified specialists in these new fields of investigation and protective or corrective action. For this reason the Association of Schools of Public Health in 1959 asked me to serve on an ad hoc committee to consider this subject. These comments cover highlights of the committee report, which was directed mainly at the master's degree curriculum.

Nonspecialists

With appropriate guidance, students of public health not specializing in environmental health may develop an appreciation and awareness of the hazards and stresses of the modern environment, so as to correlate the interaction between the physical, social, and biological environments. Currently only about 8 percent of the total hours applied toward a master's degree in a school of public health is credited to environmental health. In the opinion of the ad hoc committee of the schools of public health, this represents the absolute minimum, but it is not enough time for presenting the subject in depth. Even if the time in residence is extended, the percentage allocated to environmental health should remain at least the same. Also additional elective courses in environmental health should be available to interested students.

The allocation of priorities to a subject in the environmental health course will vary from school to school. The committee recommended that the content of the course be adjusted to the understanding that those not specializing in environmental health must acquire to obtain a balanced concept of public health implications

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of the community, occupational, and home environments. Recommended topics include:

- Water resources development, including supply and waste disposal.
- Community hygiene, including metropolitan planning.
- Interior and external atmospheres.
- Physical shelter, accident hazards, light, heat, and noise.
- Radiation as a community and an industrial problem.
- Food sanitation.
- Solid wastes disposal and vector control.

Specialists

It is important that individuals who are specializing in environmental health develop an understanding of the laws of human response to environmental stress so that they may, in turn, translate these laws into engineering terms for continued use in analysis and design of environmental structures. In this task, a mutually beneficial collaboration with biological, medical, and social scientists is indicated. For this reason, a "core" curriculum for environmental health specialists must include courses designed to develop understanding of man, environmental relationships, and responses.

The National Research Council of the National Academy of Sciences in its 1957 conference report on the "Education, Training, and Utilization of Sanitary Engineers" recommended as a core in the curriculum for sanitary and public health engineers the three basic subjects: environmental hygiene, statistics, and epidemiology. These were to amount to approximately 25 percent of the master's degree curriculum.

The ad hoc committee recommends for students enrolled in the program for the master of public health degree, or its equivalent, who specialize in environmental health that the core also include material in public health administration. Public health administration should be given time and emphasis about equal to that of each of the areas listed above.

The committee strongly recommends that candidates for the M.P.H. degree, or its equivalent, in environmental health be educated in depth in a specific field.

It was agreed unanimously that a 9-month

Committee Members

Members of the Ad Hoc Committee on Training in Environmental Health include Walter Mangold and P. H. McGaughey, University of California; Alvin R. Jacobson, Columbia University; B. G. Ferris, Harvard University; Cornelius Krusé, Johns Hopkins University; John Gannon and Clarence Velz, University of Michigan; Herbert M. Bosch, University of Minnesota; Roger Labonté, University of Montreal; Daniel A. Okun, University of North Carolina; M. A. Shapiro, University of Pittsburgh; Nelson Biaggi, University of Puerto Rico; J. R. Brown, University of Toronto; John Trygg, Tulane University of Louisiana; and Eric W. Mood, Yale University.

curriculum for a master's degree is insufficient. Graduate education in public health for specialists in environmental health should extend at least one calendar year (approximately 48 weeks), and for many students it seems essential that graduate training should be extended to two or more academic years (an academic year is considered to be approximately 32 weeks of instruction) to compensate for deficiencies of prior education or experience, or both. As an example, the study of public protection from radiation requires varying amounts of additional time, according to the history of the individual student. The need for additional training in the modern aspects of air pollution control or water pollution control has accentuated the inadequacies of the 9-month period of academic instruction. While so much more is to be learned than in the past, there is not much that can be discarded from the basic subjects of epidemiology, biostatistics, administration, and environmental hygiene if the graduate is to be considered adequately equipped for responsible duty.

In the interest of conserving time for the student, it was recommended that schools of public health investigate the possibility of offering course work on a 12-month basis and of using facilities of other units in the universities, especially for young engineers who have been recruited for public health work. Such recruits usually need both strengthening of

their knowledge of engineering and broad instruction in public health.

Engineering Schools

With respect to graduate education and research in sanitary engineering and environmental health, engineering schools, at present, train more students than schools of public health. Schools of public health have a unique opportunity and an obligation to increase such education and research programs, both in breadth and depth.

Schools of public health, being oriented to the biological and medical sciences, can draw support for their environmental health programs from departments of bacteriology and biochemistry, chemistry, and physiology. Thus their programs can be enriched in depth in dealing with the study of the nature of the environment and its effect on man. They can be expected also to draw strength from the natural science departments of the university.

Prerequisites

Engineers who plan to pursue graduate studies should have a baccalaureate degree in engineering, with adequate course work in chemistry, biology, and physics.

Sanitary scientists should have a baccalaureate degree in science, with a major in one of the natural sciences, together with adequate course work in chemistry, biology, physics, and mathematics.

If engineers or sanitary scientists are lacking such prerequisites, they should expect to make up the deficit either as a part of their regular program or before entering into the regular program.

The committee agreed that it is desirable to recruit engineers and scientists into graduate work directly from undergraduate training. Apparently, also, the Public Health Service traineeship program for professional personnel encourages entrance of students with little or no prior public health experience. At some schools, the only master's degree program open is the M.P.H., which generally has a requirement of 3 years of public health experience. A number of schools allow entrance to the master of science program without prior public health

experience. This committee did not recommend necessarily a change in the entrance requirements for the M.P.H. degree. However, it did recommend that there be a mechanism for allowing students to enter a master's program directly from undergraduate work.

Advanced Training

Training beyond the master's level for environmental health personnel is badly needed now and will be needed even more in the future for both teaching and research positions. The challenges of air pollution, radiation, water pollution, and occupational hazards have aggravated a severe shortage of engineering, scientific, and medical manpower. Facilities for training to the doctoral level and at the post-doctoral level must increase. The traineeship program operated by the Public Health Service under the Health Amendments Act of 1956 is a step in the direction of encouraging promising students to embark on environmental health and other public health careers. The number of master's degrees awarded in sanitary engineering (by engineering schools) has increased from 124 per year in 1956 to 197 in 1959.

Sanitary engineers and other environmental health personnel function primarily in the "public domain." More than half are employed by government, by nonprofit agencies, and by educational institutions. Their financial reward is almost certain to be less than that of their colleagues in industry. But dedicated candidates may be attracted by an opportunity for more extensive education and by the opportunity for productive research.

Schools have great difficulty in finding support for graduate students dedicated to research in environmental health. In each instance, no fewer than 3 years of graduate study and research are necessary for this training. A few students have been aided by sanitary engineering research scholarships. Others, aided by university research assistantships which limit the allowable course load, have had to extend considerably their stay at the university to complete their work for the doctorate. Many who would qualify for doctoral programs are deterred by the financial hardships.

In environmental health, as in other graduate

studies of the schools of public health, a balanced and continued program of support helps to attract and retain superior investigators and teachers. Good facilities and an active research program can only benefit from an adequate assurance of tenure. At present, graduate faculty members are frequently supported in large part by research grants which are allotted only year by year. With such financing, universities find it difficult to give investigators firm assurance of tenure, so as to encourage continuity of the staff.

The following steps would improve the

quantity and quality of environmental health: (a) an expanded program of financial assistance to those seeking graduate study to improve their qualifications for careers in environmental health; (b) a substantial program of financial assistance for predoctoral and postdoctoral study for those qualified for research and teaching careers in environmental health; (c) a program of coordinated assistance to schools of public health in support of the strengthening and expansion of staff and facilities for teaching and research centers in environmental health.

Planning Help for Mentally Retarded Children

An integrated statewide program for mentally retarded children was recommended in March 1960 by the Committee on Medical Care of the Maryland State Planning Commission. In a report to the Governor, the Subcommittee on Medical Services and Facilities for Handicapped Children urged that services and facilities of groups and agencies responsible for the health and welfare of mentally retarded children be coordinated into a flexible program to aid these children and their families. Specific proposals were:

- Construction of a second institution of 1,000 beds for mentally retarded children in the Washington metropolitan area, reasonably close to the research facilities of the Federal Government. (Custodial services and treatment are now centralized at the Rosewood State Training School in Owings Mills, Md.)
- Appointment of a committee by the Governor to assist in planning the new institution.
- Trial location of three additional small combination day care centers and residential half-way houses in medium-sized or small cities. In

addition to day care for local retarded children, these half-way houses would provide residential care for patients who might benefit from being near their families or who are being transferred from a large residential school to their community. If these pilot projects are successful, an increase in number would be recommended in order to eliminate the need for additional large-sized institutions which are presently projected for a decade hence.

- The Maryland State Department of Education and appropriate county departments of education assume responsibility for operating the schools at the State training institutions for the retarded.
- A study to determine the kind of vocational rehabilitation services that should be provided and the extent to which present services should be augmented.
- Appointment of a deputy commissioner or director to coordinate the State's institutions for mentally retarded children with local health and education services and with various community agencies and groups.

Mortality From Infections

CARL C. DAUER, M.D.

CONTRARY to a common assumption, infectious diseases or processes are still important causes of death. In the United States, more than 100,000 deaths are reported each year for which infections are stated to be the underlying cause. This number is exceeded only by the numbers of deaths from three major chronic diseases: heart disease, cancer, and cerebral hemorrhage.

The purpose of this brief preliminary report is to call attention to a rising trend in mortality from a number of infections. Most of these are due to bacterial agents, although they are seldom included in studies of infectious diseases and, except for two categories of sepsis that may be regarded as systemic infections, they include infections that affect specific organs of the body. It is estimated that only a small proportion of the deaths from infections were caused by viral agents, in spite of the fact that incidence of viral infections is relatively high.

All data presented are from final annual vital statistics reports for the United States for the years 1949-58, except for some provisional data for 1959. This analysis has been limited to the period subsequent to 1948 because of changes made in the International Classification of Diseases at that time. These changes affected the comparability of figures for some categories of infections.

Septicemia and Pyemia

Septicemia and pyemia are included in one rubric in the International Classification of Diseases and, for the sake of brevity, will be

Dr. Dauer is medical adviser to the chief, National Office of Vital Statistics, Public Health Service.

referred to as septicemia in the remainder of the text and in tables and charts.

An epidemiological note in *Public Health Reports* for April 1959 (1) called attention to an increase in number of deaths from septicemia from 1949 to 1957. Table 1 and figure 1 show that total deaths from septicemia increased threefold over the 11-year period 1949-59. During the same period the number of deaths from staphylococcal septicemia increased sevenfold, and deaths from other specified types and from unspecified types, about threefold. The "other specified" category includes deaths caused by such bacterial agents as *Escherichia coli*, *Pseudomonas*, *Klebsiella*, and certain other organisms. The unspecified group includes those deaths from septicemia for which physicians did not specify an etiological agent when certifying the cause of death.

In contrast to these increases, deaths from streptococcal and pneumococcal septicemia declined during the 11-year period.

Infections of the Newborn

Mortality from infections of the newborn includes deaths from infections in infants under 1 month of age. As shown in table 2 and figure 2, the mortality rates for the entire category remained relatively stationary from 1950 to 1955, after which time there was an increase of about 30 percent. Since deaths from pneumonia of the newborn constitute a large proportion of the total neonatal deaths, the trend for pneumonia sets the pattern for the whole group.

The number of deaths from sepsis of the newborn increased steadily over the entire period, about 240 percent from 1949 to 1958. The

trend closely followed the trend of septicemia shown in table 1. Sepsis of the newborn includes sepsis of the umbilical cord and "other sepsis," mainly the latter. Many of these deaths probably are caused by the same etiological agents that cause septicemia in infants

1 month of age or over. On the other hand, one of the infections of the newborn common in past years, namely, diarrhea, is causing an increasingly smaller number of deaths.

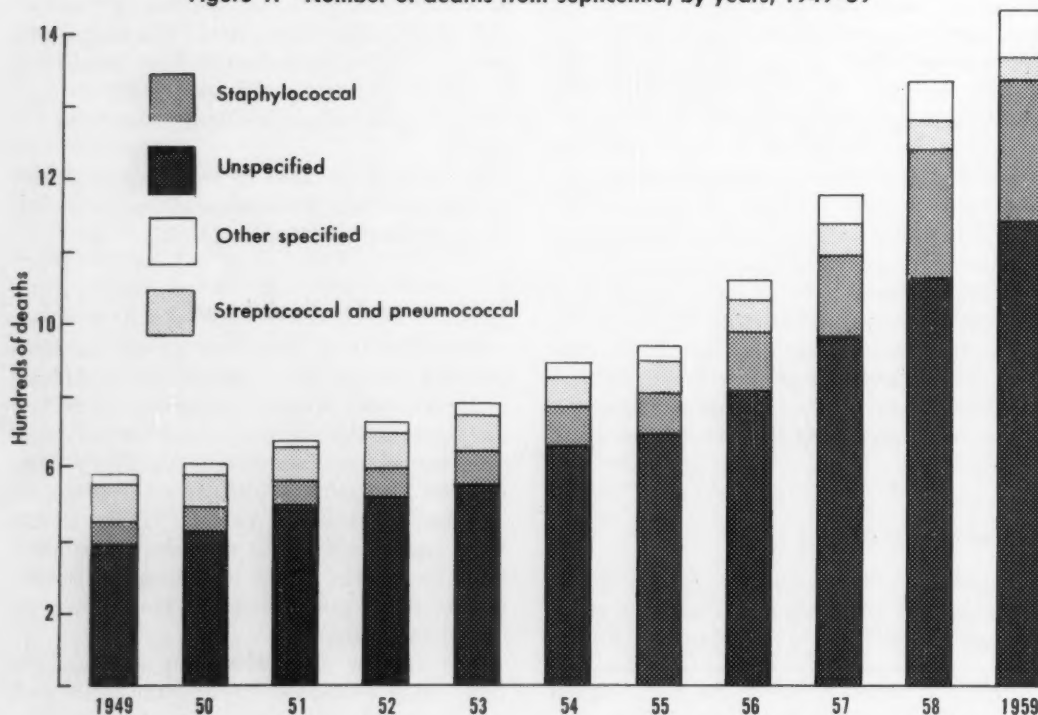
The category "other infections of the newborn" is made up almost entirely of pemphigus

Table 1. Deaths from septicemia and pyemia, 1949-59

Year	Staphylococcal	Streptococcal and pneumococcal	Other specified	Unspecified	Total	Rate per million
1959 ¹	390	60	130	1,280	1,860	10.5
1958	353	94	90	1,126	1,663	9.6
1957	217	90	76	968	1,351	7.9
1956	160	87	54	817	1,118	6.7
1955	111	89	43	695	938	5.7
1954	109	81	44	663	897	5.6
1953	94	97	38	554	783	4.9
1952	79	96	31	520	726	4.7
1951	64	89	24	500	677	4.4
1950	62	96	29	429	616	4.1
1949	54	108	27	398	587	3.8

¹ Provisional.

Figure 1. Number of deaths from septicemia, by years, 1949-59



neonatorum. No increase in number of deaths from this cause has been apparent in recent years.

A more detailed discussion of infections in infants has been published in *Public Health Reports* (2).

Other Specified Infections

Certain categories of infections have been selected for presentation in this report because

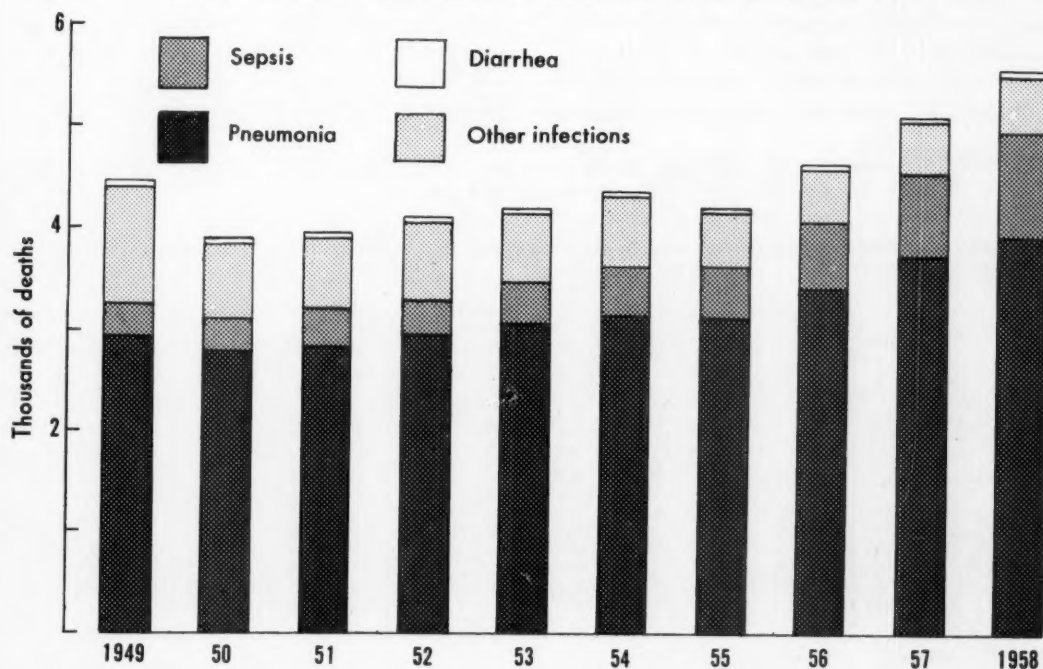
of increasing mortality from these causes in recent years (table 3).

Although mortality from influenza and pneumonia, nearly all of which is credited to pneumonia, has fluctuated because of influenza epidemics, influenza and pneumonia mortality has continued high for the past 3 years. It is questionable, however, whether all of this increase can be attributed to the effect of the 1957-58 influenza epidemic. Although relatively little influenza was reported in 1959, the

Table 2. Deaths from infections of the newborn, 1949-58

Year	Pneumonia	Diarrhea	Sepsis	Other	Total	Rate per 10,000 live births
1958	3,918	531	1,055	27	5,531	13.1
1957	3,715	516	832	24	5,087	12.0
1956	3,400	527	662	24	4,613	11.1
1955	3,108	547	518	28	4,201	10.3
1954	3,140	700	485	36	4,361	10.8
1953	3,074	697	388	28	4,187	10.7
1952	2,943	773	356	22	4,094	10.6
1951	2,825	687	387	28	3,927	10.5
1950	2,771	730	320	25	3,846	10.8
1949	2,966	1,142	307	56	4,471	12.5

Figure 2. Number of deaths from infections of the newborn, 1949-58



influenza and pneumonia mortality rate remained at a relatively high level.

Mortality from empyema and abscess of the lung declined for several years at the beginning of the period covered in this report, but the trend has been reversed since 1955. Two out of three deaths in this category were due to abscess of the lung.

The trend of mortality from infections of the skin and cellular tissue, principally boils, carbuncles, and cellulitis, was progressively downward for several years subsequent to 1949. However, a reversal of this trend is evident for the past few years.

Infections of the kidney, mainly pyelonephritis, have been certified as the underlying cause of an increasingly larger number of deaths since 1951. At present, there are only two other categories of infections, tuberculosis and pneumonia, for which more deaths are reported annually. This high frequency of deaths from infections of the kidney is consistent with clinical impressions that these infections are relatively common causes of illness.

Between 1957 and 1958 mortality from meningitis rose 10 percent, and the provisional figures for 1959 suggest that the higher level of mortality is being maintained. In tables and charts and in subsequent discussions, this category will be referred to as meningitis, which excludes tuberculous and meningococcal forms. The meningitis mortality category

consists of four groups, deaths due to *Haemophilus influenzae*, to pneumococci, to other specified organisms, and to unspecified types of organisms. There has been some decrease in meningitis due to *H. influenzae* and a corresponding increase in deaths due to other specified organisms. The numbers and proportions of the total meningitis deaths due to pneumococci and to unspecified types of organisms have remained constant in the decade under study.

Mortality rates for osteomyelitis and for otitis media and mastoiditis declined for several years following 1949 but have remained constant in the past few years.

Mortality rates for other categories of infections were also examined to see whether there had been any increase in recent years. The trend for bronchitis has been similar to that of influenza and pneumonia, while mortality from bronchiectasis has remained at about the same level since 1949.

Deaths from one category of infections, namely, sepsis associated with abortions and the puerperium, have shown a rather consistent decline during the 10-year period. During the period 1949-56 the mortality from peritonitis remained relatively constant, but in 1957 and 1958 there was a moderate increase compared with previous years. It remains to be seen whether this is the beginning of a rising trend that is evident for some other infections.

Table 3. Numbers of deaths and death rates per million population for specified types of infections, 1949-59

Year	Influenza and pneumonia		Empyema and lung abscess		Infections of skin and cellular tissue		Infections of kidney		Meningitis		Otitis media and mastoiditis	
	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate
1959 ¹ -----	57,300	32.5	-----	-----	-----	-----	6,447	36.5	2,230	12.6	-----	-----
1958-----	57,439	33.1	895	5.2	488	2.8	6,889	39.7	2,247	12.9	433	2.5
1957-----	61,001	35.8	862	5.1	483	2.8	6,346	37.2	2,025	11.9	398	2.3
1956-----	47,103	28.2	835	5.0	413	2.5	5,767	33.8	1,933	11.5	383	2.3
1955-----	44,510	27.1	738	4.5	326	1.9	4,911	29.9	1,873	11.4	468	2.8
1954-----	40,991	25.5	743	4.6	335	2.1	4,300	26.7	1,829	11.3	455	2.8
1953-----	52,238	33.0	749	4.7	322	2.0	4,052	25.6	2,059	13.0	467	2.9
1952-----	46,265	29.7	715	4.5	314	2.0	3,691	23.7	1,918	12.3	463	2.9
1951-----	48,169	31.4	740	4.8	373	2.4	3,261	21.2	1,881	12.2	492	3.2
1950-----	47,120	31.3	838	5.5	354	2.3	3,129	20.7	1,839	12.1	538	3.5
1949-----	44,640	30.0	920	6.1	413	2.7	3,128	20.8	2,147	14.3	920	6.3

¹ Provisional.

Infections of the gastrointestinal tract have not been included in this report because their etiology is quite different from that of the infections mentioned. However, it may be said here that a gradual decrease in mortality from gastrointestinal infections has been evident in the period under study.

Mortality from some categories of infection has been increasing since the beginning of the period of this study. Mortality for some causes declined early in the period but increased in more recent years. A few categories showed a decrease in mortality initially but have remained stationary in the last few years of the decade.

In order to determine the significance of the increase in mortality, data for certain of the categories have been tabulated by age, race, and geographic division (tables 4-6).

Age

Mortality for most infections included in this report has a similar age curve or pattern, relatively high in infants and older persons and low in the intervening ages. Comparison of the mean annual mortality rates for specified age groups in two 3-year periods, 1953-55 and 1956-58 (table 4) indicated the following:

- Mortality from influenza and pneumonia did not increase in the groups under 15 years of age. In the groups 15 years old and over, the amount of increase varied from about 15 to 25 percent.

- For empyema and lung abscess the increase in mortality was confined to children under 5 years old and persons 45 years of age and over.

- An increase in mortality from septicemia occurred in all but one age group, namely, 5-14 years.

- Mortality from infections of the skin and cellular tissue increased in all age groups except children 5-14 years old.

- The increase in mortality from infections of the kidney occurred in persons 25 years of age and over.

- It appears that the slight recent increase in mortality from meningitis was confined to infants under 1 year of age.

Race

The data in table 5 show that mortality was consistently higher in the nonwhite than in the white population. However, the percentage increase in mortality from 1953-55 to 1956-58 was remarkably similar for both racial groups for each cause except that there was a 12.2 percent increase in mortality from empyema and lung abscess in the white population and a slight decrease for nonwhites. An increased number of deaths from most of these categories of infections was apparent for Indians and other racial groups.

Geographic Divisions

Mortality rates for several infections are shown for each geographic division of the

Table 4. Mean annual mortality rates for specified causes, by age, 1953-55 and 1956-58

Age (years)	Influenza and pneumonia ¹		Empyema and lung abscess ²		Septicemia ²		Infections of skin and cellular tissue ²		Infections of kidney ²		Meningitis ²	
	1953-55	1956-58	1953-55	1956-58	1953-55	1956-58	1953-55	1956-58	1953-55	1956-58	1953-55	1956-58
Under 1.....	242.1	246.9	8.7	12.9	78.9	104.7	9.9	14.4	12.1	13.1	189.2	209.9
1-4.....	16.7	16.6	.4	.8	7.0	8.5	.7	.8	1.5	1.2	26.6	25.5
5-14.....	2.9	2.8	.3	.2	1.6	1.4	.2	.2	.9	1.0	4.7	4.4
15-24.....	2.8	3.6	1.0	.8	1.2	1.6	.3	.6	3.1	3.8	2.6	2.7
25-44.....	5.4	6.3	2.5	2.2	1.6	2.3	.6	1.0	9.9	11.9	3.8	3.1
45-64.....	22.7	26.1	8.6	9.2	4.8	7.3	2.6	3.2	39.2	51.6	8.7	8.9
65-84.....	135.6	155.9	20.1	23.6	12.7	22.4	9.3	13.8	163.0	234.3	15.1	14.9
85 and over..	801.2	939.2	24.2	32.4	28.2	51.7	37.6	49.3	525.5	764.4	17.5	16.8

¹ Rate per 100,000 population.

² Rate per million population.

Table 5. Mortality rates per million population for specified causes, by race, 1953-55 and 1956-58

Cause of death	White		Nonwhite	
	1953-55	1956-58	1953-55	1956-58
Septicemia and pyemia	4.9	7.3	9.6	14.3
Infections of newborn	8.2	9.2	24.9	28.4
Influenza and pneumonia	255.0	294.0	531.0	561.0
Empyema and lung abscess	4.1	4.6	9.0	8.9
Infections of skin	1.8	2.6	3.4	4.5
Infections of kidney	25.4	34.2	44.2	61.7
Meningitis	9.6	9.7	31.0	31.8

United States in table 6. Rates for each cause are fairly uniform in the various areas, and increases from 1953-55 to 1956-58 occurred almost without exception for each cause in all divisions.

Mortality rates for certain infections for the United States and for England and Wales are shown in table 7. These data show certain differences and some similarities.

Mortality from septicemia has been higher in the United States than in England and Wales and has shown a fairly substantial rise. In England and Wales the trend has been downward. Mortality from meningitis has been about 20 to 30 percent higher in the United States, but trends have been similar in the two countries. Mortality from empyema and lung abscess has been about the same in both coun-

tries. Mortality from infections of the kidney has been about equal, and an upward trend in rate is evident in both countries. A higher rate of mortality from infections of the skin has occurred in England and Wales than in the United States, but the direction of their trends has been different. For most years, mortality from infections of the newborn has been higher in England and Wales, and again the trends have been in opposite directions.

It is possible that some of these differences are due to variations in certification of deaths, and some may also be due to differences in environmental factors.

Comment

Data on mortality from various categories of infection indicate that there has been a definite increase in numbers as well as rates in recent years in the United States. Total numbers for some categories have been small, but the increases seem to be real because data by age, race, and geographic location are consistently in the same direction.

Provisional data for 1959, based on a 10 percent sample of all deaths registered, showed a continuing increase in deaths from septicemia. Influenza and pneumonia deaths and meningitis deaths remained at about the same level. Mortality from infections of the newborn and infections of the kidney showed some decrease. However, although the sampling error of the estimated numbers of deaths for 1959 is small for each of these categories, figures for an additional number of years are needed before

Table 6. Mean annual mortality rates per million population for specified infections, by geographic division, United States, 1953-55 and 1956-58

Geographic division	Influenza and pneumonia		Empyema and lung abscess		Septicemia		Infections of skin		Infections of kidneys	
	1953-55	1956-58	1953-55	1956-58	1953-55	1956-58	1953-55	1956-58	1953-55	1956-58
New England	252	340	4.7	6.0	6.4	12.6	3.1	3.9	34.8	47.8
Middle Atlantic	263	325	4.7	5.3	4.7	6.9	1.8	3.4	25.4	37.3
East North Central	269	312	4.6	4.4	4.2	6.0	1.8	2.4	26.9	35.1
West North Central	300	323	4.1	4.7	5.5	8.3	2.3	2.4	26.4	32.4
South Atlantic	298	327	4.8	5.8	6.6	9.9	2.3	3.4	30.1	42.9
East South Central	350	360	3.6	4.4	5.3	8.0	2.0	1.9	28.9	41.5
West South Central	304	325	4.8	5.1	7.9	12.3	2.0	2.2	27.4	36.2
Mountain	329	366	4.4	4.7	7.0	8.0	2.2	2.7	19.6	25.5
Pacific	247	292	5.0	5.7	4.2	6.9	1.6	3.2	26.8	37.6

Table 7. Crude mortality rates for specified infections, United States compared with England and Wales, 1949-58

Year	Septicemia ¹		Meningitis ¹		Empyema and lung abscess ¹		Infections of kidney ¹		Infections of skin ¹		Infections of newborn ²	
	United States	England and Wales	United States	England and Wales	United States	England and Wales	United States	England and Wales	United States	England and Wales	United States	England and Wales
1958-----	9.6	(³)	12.9	(³)	5.2	(³)	4.0	(³)	2.8	(³)	13.1	(³)
1957-----	7.9	2.2	11.9	9.3	5.1	4.4	3.7	3.8	2.5	3.2	12.0	11.0
1956-----	6.7	2.4	11.5	8.6	5.0	4.0	3.4	3.5	2.0	3.6	11.1	12.6
1955-----	5.7	1.8	11.4	8.3	4.5	4.9	3.0	3.3	1.7	4.2	10.3	14.6
1954-----	5.6	2.8	11.3	8.0	4.6	5.2	2.7	3.0	1.7	4.4	10.8	12.3
1953-----	4.9	2.7	13.0	9.2	4.7	5.5	2.6	2.7	1.6	4.8	10.7	14.2
1952-----	4.7	2.5	12.3	7.8	4.5	4.8	2.4	2.5	1.6	4.7	10.6	14.9
1951-----	4.4	2.5	12.2	9.0	4.8	5.1	2.1	2.5	1.8	5.6	10.5	14.3
1950-----	4.1	3.8	12.1	9.3	5.5	4.9	2.1	2.4	2.0	5.1	10.8	15.8
1949-----	3.8	3.3	14.3	9.7	6.1	5.4	2.1	2.2	2.1	5.1	12.5	9.2

¹ Rate per million population.

² Rate per 10,000 live births.

³ Data not available.

it can be assumed that the trends have continued upward, remained stationary, or reversed. The frequencies for other categories of infection are too small to warrant using the 1959 provisional figures.

It would be desirable to identify etiological agents involved in the various categories of infection, but such information is available only in tabulations of a certain proportion of the deaths from septicemia and meningitis. It is possible that the etiological agent was known for many of the deaths listed as unspecified type of septicemia but was not mentioned by the certifying physician. With respect to deaths from empyema and lung abscess, infections of the skin, sepsis of the newborn, and certain other infections, the etiological agent may be included on the death certificate but no provision has been made for coding and tabulating causes so as to identify deaths associated with staphylococci, streptococci, or other specific bacterial agents.

It would also be desirable to identify sources of infection, such as a hospital or some other identifiable source. Although most deaths from infections occur in hospitals, it is not possible to determine from death certificates what proportion of the fatal infections were hospital acquired.

If a large number of death certificates are examined, it becomes apparent that there are

many deaths for which one or the other of the categories included in this report is mentioned as a contributing cause. It is estimated that the number of deaths in which infections are a contributing cause is several times larger than the number of those in which infections are certified as the underlying cause. Thus, it is apparent that the role of infections associated with deaths is far greater than is indicated by the numbers shown in the tables. It is conceivable that there is a still larger volume of unreported nonfatal infections occurring in hospitals and elsewhere.

In order to produce more meaningful data physicians should always include the type of etiological agent, if known, when certifying the cause of death. The second step in making mortality data more valuable would be to code and tabulate certain causes of death by etiological agent. Finally, if it were possible to enumerate all other deaths in which specific types of infection were associated as contributing causes, a still better appreciation of the total volume of severe infections could be obtained.

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Poliomyelitis in an Immunized Community

REIMERT T. RAVENHOLT, M.D., M.P.H.

COMMUNITY outbreaks of poliomyelitis have been reported frequently in the literature, particularly during the last 30 years. Yet new epidemiological patterns, as observed in the outbreak of 113 paralytic cases of poliomyelitis in Seattle-King County, Wash., in 1959, recall the wisdom of Benjamin Rush (1): "Above all, record the epidemics of every season. Such records, if published, will be useful to foreigners and a treasure to posterity."

Background

Since 1901 when the first poliomyelitis case (a death) was documented in Seattle, 2,904 cases and 294 deaths have been recorded. Although faulty diagnosis, incomplete reporting, and poor records detract somewhat from the accuracy of the statistical record, especially during the earlier decades, the data do permit the conclusion that 1910, with 88 cases and 15 deaths, was the first year that epidemic poliomyelitis was recognized in this community and that the greatest morbidity and mortality rates (40 cases and 6.3 deaths per 100,000 population) occurred in 1924. Poliomyelitis occurred

with a natural periodicity of about 3 to 4 years during the 40-year interval 1908 to 1948. Reported morbidity was then sustained at the high level of about 20 cases per 100,000 population for 7 years (table 1, fig. 1). Beginning in 1955, a rapid decline occurred, with sustained low morbidity rates and no deaths during 1956, 1957, and 1958. Then during 1959, a sharp increase occurred which produced morbidity and mortality rates approaching those observed during the 1950-54 period.

The sustained decrease in poliomyelitis cases from 1955 through 1958 coincided with intensive Salk vaccination activity (table 2), which had reached a high proportion of the population by May 1959. A survey of the vaccination status of school children in May 1959, revealed that about 93 percent of all elementary school children had received at least three doses of Salk vaccine. In the poorest school districts, however, only about 46 percent of kindergarten children were so protected on entry to school, despite the availability of free vaccination through well-child clinics (table 3). More publicity was therefore generated concerning the routine availability of free vaccination from a daily central clinic and outlying weekly well-child clinics. In addition, a mobile, door-to-door vaccination program was conducted during June in the High Point public housing project, with a followup clinic in July. By this means 966 injections of Salk vaccine and 250 DTP injections were administered to the 1,200 families residing in this housing project. Even after this campaign many residents of the housing project remained unvaccinated because of fear of vaccination or absence from the area during the canvass.

An approximate measure of the vaccination status of the community was derived as a by-product of a summer-long study of swimming-

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Dr. Theodore Eickhoff, Epidemic Intelligence Service, Public Health Service, Kennan Hollingsworth and Shun Chow Ling, medical students, and Barbara Le Cocq, public health nurse, assisted in collecting the data for the study.

associated illnesses. Among 1,000 families who visited six beaches in the metropolitan area during August 1959 and who could be contacted again by telephone (therefore derived from the 80 percent of households which have telephones), the poliomyelitis vaccination status of persons under 40 years of age was as follows: 13 percent, no vaccination; 3 percent, one shot; 7 percent, two shots; 65 percent, three shots; and 12 percent, four or more shots. In addition, from three spot surveys in the lowest socioeconomic neighborhoods and from knowledge of vaccinations performed during recent years, it was known that the least immunized members of the community were (a) residents of low-income housing areas, including Negroes, (b) preschool children and adults, especially adult males, and (c) firm believers in Christian Science.

Despite these vaccination defects no substantial increase in poliomyelitis during 1959 was anticipated, because of low incidence during 1956-58 and because the community was significantly better immunized than during those years. Therefore, when it became apparent during August that despite such protection Seattle was experiencing a substantial outbreak of poliomyelitis, a thorough epidemiological investigation was begun.

Method of Investigation

Detailed information concerning each patient was obtained by means of home and hospital visits and telephone calls and from physicians' and clinical records. As usual, age, sex, race, occupation, onset date, symptoms, clinical findings, and vaccination and pregnancy status for each patient were ascertained. Also, extensive data concerning each patient's exposure to theoretical common sources such as food (especially fruit and vegetables), water (including 1959 swimming experience), physicians, injections, dentists, insects, travel, and ill persons were obtained. In addition, the tonsillectomy status of each patient and the religious preference of each patient and his family were ascertained, and each patient's residence was visited and photographed to provide more exact knowledge of housing and socioeconomic status. Later, the paralytic status of each patient alive

60 days after onset of illness was ascertained. Experienced investigators assisted in collecting data, and whenever necessary, patients and physicians were queried repeatedly.

As usual, all death certificates received by the

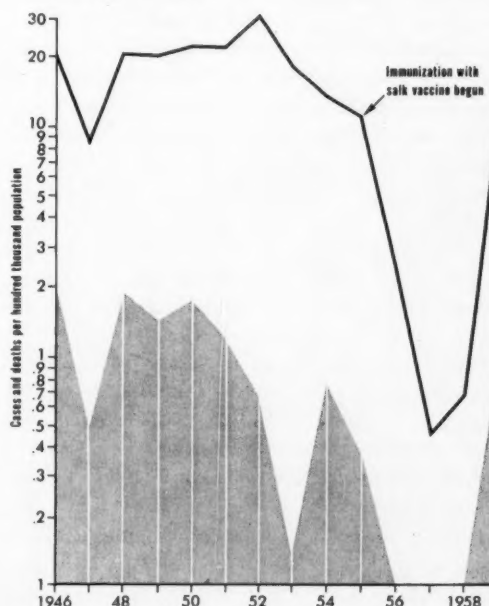
Table 1. Poliomyelitis occurrence by year, Seattle-King County, Wash., 1946-59

Year	Cases		Deaths		Fatality rate (percent)
	Number	Rate ¹	Number	Rate ¹	
1946	133	19.8	13	1.93	9.77
1947	54	8.3	3	.46	5.56
1948	141	20.6	13	1.90	9.22
1949	143	20.2	10	1.42	6.99
1950	165	22.5	13	1.77	7.88
1951	166	22.1	9	1.20	5.42
1952	236	30.9	5	.65	2.12
1953	144	18.4	1	.13	.69
1954	² 108	13.6	6	.75	5.56
1955	² 90	11.1	3	.37	3.33
1956	² 22	2.6	0	0	0
1957	² 4	.5	0	0	0
1958	² 6	.7	0	0	0
1959	² 113	12.8	8	.90	7.08

¹ Per 100,000 population.

² Paralytic cases only.

Figure 1. Poliomyelitis cases and deaths per 100,000 population, Seattle-King County, Wash., 1946-59



health department were inspected, and followup investigations were made whenever information given on a certificate suggested that such investigation might significantly improve understanding of the contribution of infection toward that death.

Attending physicians and the hospitals were requested to submit stool specimens from patients for specific diagnosis. These were examined by the laboratory of either the Seattle-King County or the Washington State Health Department, or both, by standard methods using monkey kidney cells.

Findings

Epidemiological analysis is based on the 113 paralytic poliomyelitis cases recorded during 1959. Cases were accepted as paralytic poliomyelitis if characteristic weakness of one or more muscles developed in association with fever and stiff neck. The diagnosis of almost all cases was corroborated either by spinal fluid findings or detection of poliovirus in stool, or both. Spinal fluid, which was examined in 98 cases, revealed more than 10 leucocytes per cubic millimeter in 91, and more than 40 milligram percent protein in 56. Type 1 poliovirus was isolated from 65 (82 percent) of the 79 patients from whom stool specimens were examined. No isolations of types 2 and 3 poliovirus were obtained from the patients. ECHO 9 enterovirus was isolated from 2 of these 79 patients, once in addition to type 1 poliovirus and once alone. In addition, type 1 poliovirus was isolated from stool specimens in 4 of the 88 non-paralytic aseptic meningitis cases recorded during the year, which were specifically identified as mumps (14 cases), ECHO 9 (7 cases), ECHO 6 (2 cases), Coxsackie B2 (4 cases), Coxsackie B5 (3 cases), and Coxsackie A9 (4 cases).

One death, attributed to "cerebral vascular accident," cause unknown, by the attending physician, is included as bulbar poliomyelitis because of characteristic clinical and epidemiological findings. The details of this case are reported to permit the reader to evaluate the propriety of including it as a poliomyelitis death as well as to document the value of routine inspection of death certificates, with ap-

Table 2. Poliomyelitis vaccination, Seattle-King County, Wash., 1955-59

Year	Type of program	Number doses
1955	First and second grade children, by NFIP, health department, private physician volunteers	47, 473
	Children, by private physicians, office practice	¹ 45, 000
1956	Persons less than 20 years of age or pregnant, in mass public district clinics by health department (Federal and local tax monies)	81, 391
	Children and young adults, by private physicians, office practice	¹ 395, 000
1957	Persons less than 20 years of age or pregnant, through perennial central clinic and complete, free, two-round school program for kindergarten through 12th grade in all public and private schools, by health department (Federal and local tax monies)	153, 042
	All ages, by private physician volunteers, in the three-round, mass, free, fire-station program sponsored by the King County Medical Society, United Good Neighbors, and NFIP (vaccine purchased with UGN and NFIP funds)	315, 000
	All ages, especially less than 40 years of age, by private physicians, office practice	¹ 105, 000
1958	Persons under 20 years of age or pregnant, through perennial free clinic, annual school program (as above) and well child clinics, by health department (local tax monies)	64, 440
	All ages, especially less than 40 years of age, by private physicians, office practice	¹ 110, 000
1959	Persons under 50 years of age, through perennial free clinic, annual school program (as above), well child clinics, and special clinics, by health department (local tax monies)	97, 457
	All ages, by private physicians, office practice	¹ 95, 000
Total		1, 508, 803

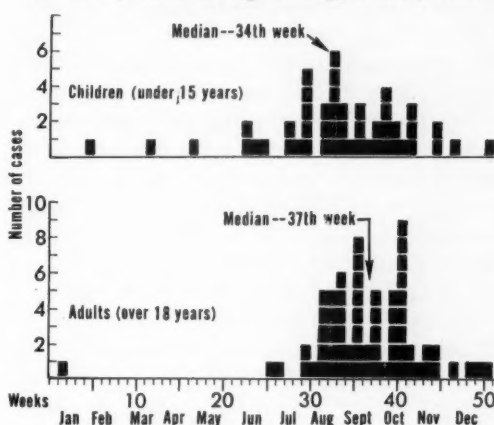
¹ Estimates from vaccine shipments.

NOTE: Estimated 1959 population: Under 20 years of age—323,000; 20-39 years of age—215,000; total—885,000.

propriate investigation, as a useful casefinding technique.

Interest was aroused by the medical certification that a 24-year-old construction worker, resident of a public housing project, had died on August 15, 1959, of "cerebral vascular accident (minutes)," due to "cause unknown," due to "influenza—5 days." Review of his hospital record revealed that he became ill on August 7, with sore throat, headache, and fever. He was admitted by wheelchair to a nonteaching hospital on August 11, under care of a surgeon, complaining of severe headache, pain in the neck, back, and abdomen, weakness of his legs, and inability to void. Examination revealed sluggish but equal reflexes, distended and tympanitic abdomen, and weakness of his legs. His temperature was 100°; white blood count, 9,850, with normal differential. His urine was normal. The initial impression was "influenza," and treatment was begun with penicillin, achromycin, steam inhalator, "pneumonia jacket," Seconal, Solu B, 5 cc. I.V., and "diathermy to lower back daily." The following day the nurse noted that he was "unable to move right leg" and needed help to turn over. He developed cough, copious sputum, and difficulty in breathing, which resulted in short, gasping respirations and oxygen treatment. It was noted that breath sounds were markedly diminished at both bases, but chest X-rays were negative on August 12 and August 15. He remained lucid and his sensation continued normal. His temperature became approximately normal after 2 days in the hospital, but he died 4 days after admission, shortly after complaining of inability to breathe, and despite additional treatment with Demerol, terpin hydrate, sodium luminol, Thorazine, oxygen, pharyngeal suctioning, and steam. No autopsy

Figure 2. Paralytic poliomyelitis cases by week of onset, Seattle-King County, Wash., 1959



or additional laboratory studies were performed, and no mention of poliomyelitis (for which he had not been vaccinated) was made in the record.

Distribution by Week of Onset

The outbreak began in June and ceased in December. The epidemic curve for children reached its peak in the 34th week and that for adults, in the 36th and 41st weeks (fig. 2). Median week of onset for children preceded the median week for adults by about 3 weeks. Seasonal distribution of cases was similar to that usually observed in this area.

Table 3. Poliomyelitis vaccination status of school children in selected elementary schools, before and after 1959 school vaccination program, Seattle, Wash.¹

Area	Percent in each category							
	No injections		At least 1 injection		At least 2 injections		At least 3 injections	
	Before	After	Before	After	Before	After	Before	After
Wedgewood: ²								
Kindergarten	5.23	3.27	94.8	96.7	94.1	96.1	91.5	94.1
All grades	2.85	2.50	97.2	97.5	96.0	97.4	94.8	97.0
Beacon Hill: ³								
Kindergarten	11.8	2.78	88.2	97.2	88.2	93.8	78.5	86.1
All grades	4.54	1.55	95.5	98.4	94.0	97.7	86.3	95.4
High Point: ⁴								
Kindergarten	29.8	17.8	70.2	82.2	69.3	77.8	45.8	70.2
All grades	18.2	11.6	81.8	88.4	78.4	86.2	69.2	79.6

¹ Figures compiled after review of each child's school record and query of parents if record incomplete. The 1959 vaccination program was conducted January through March; survey in May.

² Upper socioeconomic, all white.

³ Middle socioeconomic, 48 percent white, 44 percent oriental, 4.4 percent Negro, 3.1 percent other.

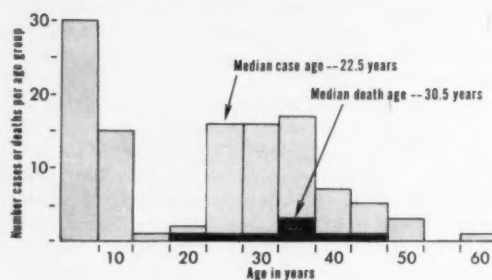
⁴ Lowest socioeconomic, 76 percent white, 18 percent Negro, 6 percent other.

Geographic and Socioeconomic Distribution

Contrasting markedly with years before vaccination became available, when poliomyelitis cases were generally distributed in Seattle-King County but with a tendency toward greater incidence in the better residential areas, during 1959 there was an easily noticeable concentration of cases in and around public housing projects in southwest Seattle-King County. Fourteen (12.4 percent) of the 113 paralytic cases were residents of public housing projects (which are mostly located in southwest Seattle). Four cases (two in unvaccinated men, one in an unvaccinated 15-month-old child, and one in a 2-year-old child with three doses of vaccine) occurred during August and September among the 1,200 families living in the High Point public housing project. The southwest Seattle focus was particularly noticeable during June, July, and August. Later the geographic distribution became more diffuse. However, upper socioeconomic residential areas, such as Magnolia, Laurelhurst, Windermere, Mercer Island, and Bellevue, remained strikingly free of cases.

Wage earners in families of patients worked at a great variety of occupations, most of which were in the "blue collar" class, such as aircraft production, construction, machinist, television repair, automobile wrecker, judo instructor, bartender, boatbuilder, and truckdriver. Six were unemployed. There were several salesmen, accountants, and engineers, but no physicians, lawyers, teachers, ministers, dentists, or college students.

Figure 3. Age distribution of paralytic poliomyelitis cases and deaths, Seattle-King County, Wash., 1959



Age and Sex Distribution

The 1959 poliomyelitis outbreak was remarkable particularly because an unusually large proportion of patients were adults (table 4, fig. 3). Sixty-seven (59 percent) of the 113 were adults (including two 19-year-olds, both of whom were parents). To my knowledge the median ages for cases (22.5 years) and deaths (30.5 years) are the highest ever recorded in a major community outbreak of poliomyelitis. Patients ranged in age from 9 months to 57 years, and those who died, from 19 to 42 years. Seventy-two (64 percent) of the 113 patients and five (62 percent) of those who died were male. Sixty-six percent of the patients 20 years or over were men, contrasting with years before vaccination became available, for example 1954, when men comprised only 33 percent of such cases. The sex reversal of adult cases was at least partially due to the decrease in cases

Table 4. Paralytic poliomyelitis cases, by age and sex, Seattle-King County, Wash., 1954-59

Age group (years)	1954		1955		1956		1957		1958		1959	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
All ages	53	55	46	44	14	8	4	0	4	2	72	41
0-4	11	7	12	6	4	2	2	0	1	0	19	11
5-9	17	8	10	6	3	1	0	0	1	0	8	7
10-14	6	6	5	4	2	1	0	0	0	1	1	0
15-19	3	2	3	2	0	1	0	0	0	1	1	1
20-29	9	23	8	15	2	3	1	0	0	0	22	10
30-39	5	8	8	11	3	0	1	0	2	0	16	8
40 and over	2	1	0	0	0	0	0	0	0	0	5	4
Median age	14.6		17.6		11.5		12.5		15.5		22.5	
Age range	3 wk.-50 yr.		5 mo.-39 yr.		16 mo.-34 yr.		18 mo.-32 yr.		18 mo.-38 yr.		9 mo.-57 yr.	

among pregnant women (table 5). Ten cases in pregnancy were recorded in 1954 and again in 1955. Then, in association with intensive vaccination of pregnant women, no cases were recorded in this group during 1956, 1957, and 1958. During 1959 only two cases in pregnant women (both unvaccinated, one a Christian Scientist) were recorded.

Ninety-six (85 percent) of the 113 patients were either preschool children (30 patients) or lived in households with preschool children (66 patients). Included in this latter group was the oldest patient, age 57, who lived with an 18-month-old granddaughter. Fifteen patients (13 percent) were either school children (7 patients) or lived in households with school children but without preschool children (8 patients). Only two adults (ages 21 and 49 years) had not had regular household contact with children during the month prior to onset; both had had sporadic contact with preschool children.

Distribution by Vaccination Status

Seventy-three (65 percent) of the 113 patients had received no Salk vaccine prior to onset of their disease; 11 (9.7 percent) had received one shot; 9 (8.0 percent), two shots; 19 (16.8 percent), three shots; and 1, four shots (table 6).

Table 6. Age and vaccination status of paralytic poliomyelitis cases, Seattle-King County, Wash., 1959

Age group (years)	Number of Salk vaccine injections					Total
	0	1	2	3	4	
0-4	17	4	2	6	1	30
5-9	4	1	3	7	0	15
10-14	0	1	0	0	0	1
15-19	1	1	0	0	0	2
20-29	27	1	1	3	0	32
30-39	17	3	2	2	0	24
40 and over	7	0	1	1	0	9
Total	73	11	9	19	1	113

For the 19 triply vaccinated patients the median time interval from third injection to onset of disease was 17 months, and the range was from 6 to 25 months. The interval appeared to be especially a function of community vaccination activities, for example, the mass programs in 1957 (table 2), rather than waning immunity. That adequate immunity is not particularly a function of time after vaccination was further indicated by the single quadruply vaccinated patient, a 3-year-old boy in whom paralytic disease from type 1 poliovirus developed 5 weeks after he received the last of four optimally spaced shots.

Table 7. Epidemiological data on paralytic poliomyelitis cases, Seattle-King County, Wash., 1954-59

Characteristic	1954	1955	1956	1957	1958	1959
Total cases	108	90	22	4	6	113
Pregnancy cases	10	10	0	0	0	2
Injections of Salk vaccine:						
0	108	89	15	0	2	73
1	0	0	3	1	2	11
2	0	1	4	3	1	9
3	0	0	0	0	1	19
4	0	0	0	0	0	1
Race:						
White	104	88	22	4	6	105
Negro	1	1	0	0	0	7
Other	3	1	0	0	0	1
Type of paralysis:						
Bulbar	44	44	8	0	3	54
Nonbulbar	64	46	14	4	3	59
Public housing resident ¹	3	2	1	0	0	14
Cases per 100,000 public housing residents ¹	15.6	10.4	5.2	0	0	73.1

¹ Current public housing project population of 19,141 persons, including 8,680 children, is similar to population at risk throughout 1954-59 period.

Poliomyelitis began 7, 8, and 26 days after initial injections in three patients. Each had received vaccine from a different manufacturer, and onset of paralysis did not correlate with limb of injection in any patient. One of these patients, a 34-year-old man, became ill 8 days after the first injection and died 1 month later. In four other case families, a family member (other than the patient) had received Salk vaccine during the month before onset of poliomyelitis. A few cases of poliomyelitis in recently vaccinated persons and families were expected because public and private immunization activities increased greatly during the outbreak. During August, September, and October the health department held many mass, free, public vaccination clinics in neighborhood fire stations, offering first, second, and third injections to all persons under 50 years of age. These clinics were well publicized and were extended to evenings and Saturdays to facilitate vaccination of working men. In these clinics the health department administered 26,136 doses of Salk vaccine during August and 20,821 during September, largely to young adults. Nevertheless, the peak of the epidemic curve for adults occurred in October, and the outbreak continued until December.

Severity of Paralysis and Vaccination Status

In this outbreak of 113 cases of paralytic poliomyelitis, there was no significant correlation of severity of paralysis with number of doses of vaccine (table 7). Case fatality rates

for unvaccinated patients (6.8 percent) and for triply vaccinated patients (5 percent) are very similar to the case fatality rate for all patients (7.1 percent). This finding, together with the fact that none of the 29 patients with two, three, or four shots recovered completely, suggests that the apparent lack of a modifying effect by vaccine is real, rather than due to limited numbers or difficulty in classifying residual paralytic disability as slight, moderate, or severe. The one triply vaccinated patient who died was a 36-year-old banknote salesman, father of five, who had completed an optimally spaced series of three shots 18 months before onset of disease.

Racial and Religious Distributions

One hundred and five patients were white, seven were Negro (ages 1, 3, 3, 4, 5, 6, and 23 years), and one was Mexican. Based on the estimated population composition of the community (2.5 percent Negro), the Negro attack rate was approximately $2\frac{1}{2}$ times that for the white population. In earlier years attack rates for Negroes were consistently lower than those for the white population (table 5).

Because surveys of vaccination status in schools, at beaches, and by telephone had revealed belief in Christian Science to be a frequent cause of nonvaccination, the religious preference of poliomyelitis patients is of particular interest. Three (2.6 percent) of the 113 poliomyelitis patients indicated membership in Christian Science churches, which have an

Table 7. Severity of paralysis in relation to number of Salk vaccine injections, Seattle-King County, Wash., 1959

Status 60 days after onset	Number of Salk vaccine injections								Total	
	0		1		2		3 or more			
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Complete recovery	7	10	1	9	0	0	0	0	8	7
Slight residual disability	19	26	1	9	2	22	6	30	28	25
Moderate residual disability	20	27	5	45	5	56	8	40	38	34
Severe residual disability ¹	22	30	2	18	2	22	5	25	31	27
Dead	5	7	2	18	0	0	1	5	8	7
Total	73	100	11	99	9	100	20	100	113	100

¹ 26 of these 31 patients were still hospitalized 60 days after onset.

estimated membership of 16,000 persons (1.8 percent of the total population) most of whom reside in middle and upper socioeconomic areas. Two of the three patients were a husband and wife, neither vaccinated, who were hospitalized with bulbar disease. Type 1 poliovirus was isolated from both. Religious belief may have prevented vaccination of a few other patients who stated their religious preference hesitantly or without complete specificity and of a few patients who may not have sought medical treatment. Religion, however, was not the principal reason for nonvaccination among the 113 patients. Procrastination, apathy, ignorance, fear of needles, and doubts concerning safety of the vaccine were the main deterrents.

Paralysis and Tonsillectomy Distributions

Fifty-five patients had had tonsillectomy more than 6 months before onset of poliomyelitis, and 1 had had the operation within the 6-month period (table 8). The proportion of patients with a history of tonsillectomy increased greatly with age, from 1 of 30 preschool children to 45 (69 percent) of 65 adults. Similarly, the proportion of patients with bulbar paralysis increased with age, from 7 (23 percent) of 30 preschool children to 35 (54 percent) of 65 adults. In contrast with earlier reports (2-9), however, the distribution of ton-

sillectomy and bulbar paralysis in these 111 patients does not indicate that tonsillectomy more than 6 months before onset of poliomyelitis disposes to bulbar paralysis. Thirty patients who had had their tonsils removed had bulbar paralysis, whereas 29.5 such patients would be expected by chance association. Furthermore, a lesser proportion of adults with bulbar paralysis who died (4 of 7) than of adults with bulbar paralysis who survived (21 of 28) had a history of tonsillectomy.

The one patient who had had a tonsillectomy during the 6 months preceding onset of poliomyelitis was an unvaccinated 24-year-old hardware salesman. He had his tonsils removed on August 3, and became ill on August 22, with headache, sore throat, fever, moderate stiffness of his neck, and double vision on lateral gaze. Spinal fluid contained 105 white cells per cubic millimeter, 40 percent polynuclear, and type 1 poliovirus was isolated from his stool. He was hospitalized 4 days and recovered completely within 4 weeks.

Swimming and Poliomyelitis

Although 21 (46 percent) of the 46 poliomyelitis patients who became ill during June, July, and August had been swimming during the month preceding onset of their disease, they had used 15 different waters. Furthermore,

Table 8. Bulbar paralysis and tonsillectomy in paralytic poliomyelitis cases, Seattle-King County, Wash., 1959

Age group (years)	Paralytic cases	Paralytic cases with history of tonsillectomy		Bulbar cases		Bulbar cases with history of tonsillectomy	
		Number	Percent	Number	Percent	Observed	Expected
All children	46	10	22	16	35	3	5.03
0-4	30	1	3	7	23	0	.23
5-9	15	8	53	9	60	5	4.80
10-14	1	1	100	0	0	0	0
All adults	66	45	69	35	54	25	24.5
15-19	2	2	100	2	100	2	2.00
20-29 ¹	30	21	70	16	53	12	11.2
30-39	24	16	67	14	58	9	9.28
40 and over	9	6	66	3	33	2	2.00
Total ¹	111	55	50	51	46	30	29.5
Deaths ¹	7	4	57	7	100	4	4

¹ Two 24-year-old patients with paralytic poliomyelitis omitted, one because tonsillectomy was performed within 1 month of onset, and the other, a death, because tonsillectomy status was not ascertained.

for 15 (33 percent) of the 46 patients no history of swimming was elicited for any family member during 4 weeks preceding onset of disease. Swimming experience of patients and their families was significantly less than the community average, a finding perhaps associated with socioeconomic status. Among 89 families selected at random from the metropolitan telephone directory and queried during August, 70 percent of individuals and 86 percent of families (at least 1 member) had been swimming during the preceding month. Also, whereas July and early August were warm and favorable for swimming, the weather became less favorable about mid-August. Cool weather, in addition to the usual late summer decrease in swimming and public fear of contracting poliomyelitis, resulted in virtual cessation of swimming about mid-August, with no apparent effect on the mounting poliomyelitis occurrence.

Other Distributions

No unusual or suggestive association of cases with water, milk, food, physicians, dentists, insects, injections, or travel was observed.

Most of the patients (especially the early ones) used Seattle city water, which is obtained from an uninhabited watershed, chlorinated, and supplied to residents of Seattle by means of an adequate distribution system and with maintenance of good pressure.

Families of patients purchased milk and food from a large variety of sources, and no pattern was discerned which suggested unusual association with certain foods, such as specific fruits or vegetables, or with certain producers. It was, of course, impossible to exclude entirely the possibility of exposure to one or more foods derived from a common source, by means of necessarily limited food-source histories.

Seattle is ordinarily remarkably free of mosquitoes, flies, and other theoretical insect vectors. Such vectors were not generally unusually prevalent during 1959, and the experience of case families was not significantly different from that of other families in the community.

The data concerning contact of case families with ill persons during the month before onset of poliomyelitis do not permit a decision as to whether such contact had occurred with un-

usual frequency. Except for three multiple-case households, only two patients gave a history of recent contact with a known case of poliomyelitis. Onset of poliomyelitis in adults was frequently preceded by febrile illness in associated children, but in the absence of a control group it is not possible to state whether morbidity of children in case families differed from that of children in neighboring families.

Discussion

The data concerning the 113 paralytic poliomyelitis cases on which this analysis is based were obtained under fairly optimum circumstances: good communication and rapport exists between health department, physicians, hospitals, and the public. Therefore, reporting of detected poliomyelitis cases was undoubtedly nearly complete. Routine use of public health laboratory services facilitated specific diagnosis and permitted inclusion of some cases (including one death) which would likely have been missed in earlier years. Likewise, routine inspection of all death certificates led to an investigation which added another poliomyelitis death to the record, one which would also probably have been missed in earlier years. Even typical poliomyelitis deaths occurring in hospitals can evidently be missed, which suggests that findings of studies which include neither readily available laboratory facilities for poliovirus isolation, nor perusal of all death certificates and further investigation when indicated, may significantly understate mortality from poliomyelitis.

The unusually great proportion of adult cases recorded in this outbreak was probably the result of multiple factors. Undoubtedly, thorough vaccination of school children, considerable vaccination of preschool children, and unusually great prevalence of virulent type 1 poliovirus were important factors. In addition, an unusually great number of susceptible adults may have accumulated in this area during past years because of environmental factors of probable importance in the prevention of transmission of poliomyelitis (9,10), such as: (a) a generally excellent water supply, (b) the weather, which causes substantial modification of living and recreational habits during the generally cool summers (as compared with most

of the continent) and results in unusually low prevalence of flies and similar, possibly significant, mechanical conveyors of virus, (c) population distribution and topography, which facilitate such activities as fishing and boating and permit frequent excursions to relatively uncrowded beaches and mountain camps (11), and (d) better than average standards of personal and household hygiene. (Census data (12) indicate that Seattle adults over 25 years of age have completed a higher median number of years of education than adults in any other of the 50 largest cities in the United States.)

That the unusually large proportion of adult patients observed in this outbreak was not entirely due to subtraction of potential child patients by thorough vaccination of that age group is indicated by a previous finding (13) that in the 1952 outbreak, before vaccination, 43 percent of paralytic poliomyelitis patients in this community were adults. Furthermore, the sex reversal of adult patients and the large decrease in cases among pregnant women in the 1959 outbreak indicate that vaccination not only prevented cases in children but also prevented many cases in adults in this community. The concept that the large proportion of adult patients in the 1959 outbreak of poliomyelitis was considerably the culmination of natural environmental factors is supported by the consistent trend toward increased age at death from poliomyelitis in this community since 1900 (fig. 4).

The concept that "the preventive effect of vaccine is more distinct as the severity of the disease increases" (14) received no support from the findings of this study (table 7). Paralytic disability was apparently equally severe in persons developing paralytic disease after complete, partial, or no vaccination, indicating that vaccination confers all-or-none protection. This conclusion, which was derived from analysis of this outbreak of 113 patients, is supported by findings of Dougherty and Faro (15) and H. W. Wylie, Jr., of the Public Health Service (personal communication).

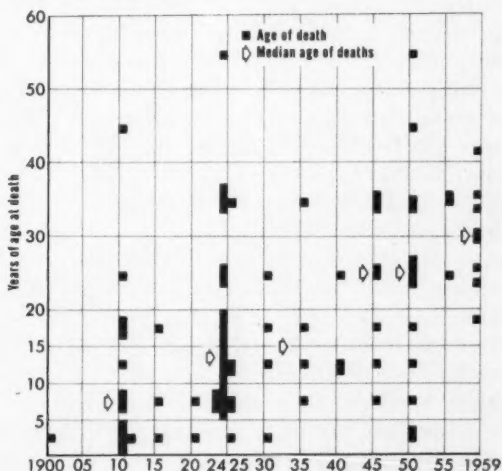
Failure of bulbar paralysis to associate with greater than chance frequency with tonsillectomy performed more than 6 months previously demonstrates an instability of association of these two factors which indicates that reports

of such an association in earlier studies (3-8) may not have been based on a cause and effect relationship. Rather, if bulbar paralysis and previous (not recent) tonsillectomy are sometimes associated with greater than chance frequency, the association is more likely a function of the age and the socioimmunological status of poliomyelitis patients. This interpretation of the findings of this study is supported by the usual greater occurrence of bulbar paralysis in adults than in children in "virgin soil epidemics" in populations with tonsils intact (16).

Very few tonsillectomies were performed in this community during the poliomyelitis season. Hence the occurrence of bulbar poliomyelitis in one person shortly after tonsillectomy enforces the general belief, based on considerable experience, that tonsillectomy does dispose to bulbar paralysis during the first subsequent month.

The occurrence of this poliomyelitis outbreak in a community which had had unusually good access to vaccination (17) has caused considerable concern and deserves explanation. Study and reflection lead to the following hypothesis:

Figure 4. Age distribution of poliomyelitis deaths, every fifth year 1900-55, and epidemic years, 1924 and 1959, Seattle-King County, Wash.



NOTE: Age of poliomyelitis deaths ascertained by inspection of all death certificates recorded in the indicated years.

Despite (and perhaps because of) extensive Salk vaccination in this community, a large proportion of preschool children in the lowest socioeconomic areas remained susceptible to type 1 poliovirus. During 1959 virulent type 1 poliovirus was introduced into these pockets of susceptible preschool children, where it was propagated and spread by contact, perhaps especially by the fecal-oral route, by the young children to their playmates and parents.

Accumulation of an unusually susceptible preschool population in some areas was apparently due to (a) unusually low prevalence of poliovirus in this community during the previous 3 years and (b) failure adequately to replace declining natural immunization with artificial immunization in preschool children in public housing projects and similar low socioeconomic areas.

The effect of extensive immunization with Salk vaccine on the propagation and distribution of poliovirus is a controversial topic, with the consensus being that such immunization does not alter its distribution (18-21). This point of view, which has been especially espoused by proponents of live virus vaccine, is apparently based largely on studies of poliovirus distribution, according to vaccination and antibody status, in members of certain Louisiana households (18, 20, 21) and on poliovirus distribution in household contacts of paralytic poliomyelitis cases (19). A review of the data presented in these studies causes diminished confidence in the accuracy of the conclusions.

In 1956, for example, it was stated that "two doses of Salk vaccine did not materially influence the frequency of alimentary infection or the amount of virus excreted in the feces" (18). This conclusion was based mainly on the finding that in the study population household episodes of poliovirus infection occurred with approximately the same frequency during 1956, after two doses of Salk vaccine, as in 1955, before vaccination. It was noted, however, that a reduction did occur in the "estimated true mean of virus excretion (37.7 days after vaccination and 51 days before), of uncertain significance." The following year, after the study population had received a third dose of vaccine, a moderate diminution in the duration of poliovirus excretion in feces was again ob-

served, but it was concluded that "widespread use of Salk vaccine should not by any reasonable mechanism influence poliovirus dissemination" (20). This conclusion was reiterated despite a sharp decline in household episodes of poliovirus infection in 1957, which was discounted as a "natural variation in dissemination of virus, due to causes as yet unknown." However, it was failure to observe such a decline in 1956 which was the cornerstone of the conclusion that immunization with Salk vaccine exercised no influence on the distribution of poliovirus in the community. Hence, the excellent data derived from these studies are not as decisive as the conclusions made concerning the lack of effect of immunization with Salk vaccine on poliovirus distribution.

Similarly, from a study of poliovirus excretion by household contacts of poliomyelitis patients the statement was made that "the quantity of virus in the feces of vaccinated children is not detectably different from that in the specimens of those not vaccinated," despite presentation of data which show that the median negative log of poliovirus titer in fecal specimens of those vaccinated was 2.0 (45 determinations), whereas in feces of those not vaccinated it was 2.78 (95 determinations) (19).

Other investigators have found poliovirus less frequently and in less quantity in the pharynx or feces, or both, in vaccinated experimental animals and household contacts of poliomyelitis cases than in those not vaccinated (22-27).

Although conclusions of investigators vary greatly, their data are in general accord with the concept that immunization with Salk vaccine, especially three or more injections, causes moderate reduction in the frequency, duration, and titer of alimentary poliovirus infection of humans and experimental animals exposed to infection. This interpretation of the data is supported by the changed epidemiological pattern of poliomyelitis occurrence observed since vaccination was begun. The rapid decline in poliomyelitis incidence in Seattle-King County, as well as nationally (28), during 1956-57 could have been mere coincidence, or due entirely to direct protection by the vaccine. But the abrupt absolute as well as relative increase in

attack rates among lower socioeconomic groups, especially residents of public housing projects and preschool Negroes, which has been observed during the last 3 years in Seattle-King County (table 5) and elsewhere (27, 28) indicates a fundamental disturbance of poliovirus ecology, probably due to vaccination. If so, eradication of poliovirus from large populations by more nearly universal immunization with Salk vaccine may be possible. Such eradication of poliovirus from a community, however, would be temporary and hazardous if pockets of highly susceptible preschool children were permitted to develop. Permanent success in the prevention of epidemiogenic pockets of susceptible preschool children will probably depend on perennial extension of community vaccination programs. Improvements in existing vaccination programs should be designed particularly to achieve early vaccination of preschool children in the lowest socioeconomic groups, who are currently the prime propagators of poliovirus (and many other infectious agents). Adequate immunization of this high-priority group, without resorting to legal compulsion, can probably be achieved by persuasion, by making vaccination maximally available, and by a cooperative arrangement between the health department and public housing authorities which would facilitate vaccination of virtually all families moving into public housing projects.

Summary

Investigation of 113 cases of paralytic poliomyelitis which occurred in Seattle-King County in 1959 revealed the following epidemiological patterns:

The outbreak was largely, perhaps entirely, caused by type 1 poliovirus, which was isolated from 65 (82 percent) of the 79 patients from whom stool specimens were examined.

The outbreak began in June, reached peaks in August, September, and October, and ended in December. Median week of onset in children preceded median week in adults by about 3 weeks.

A predilection for cases to occur in the lower socioeconomic families, especially among residents of public housing projects in southwest Seattle-King County, was discerned. Four

cases occurred among 1,200 families in one housing project during August and September despite a door-to-door vaccination program during June.

The Negro attack rate was approximately $2\frac{1}{2}$ times that for the white population.

Religious belief was the cause of nonvaccination for at least three patients.

Swimming was not a significant factor in the epidemiogenesis of this outbreak.

Sixty-seven (59 percent) of the 113 patients were adults. Ages ranged from 9 months to 57 years, with a median of 22.5 years. Patients who died ranged in age from 19 to 42 years, with a median of 30.5 years. Seventy-two (64 percent) of the 113 patients and five (62 percent) of the eight who died were male. Only two cases in pregnant women were recorded.

Only two of the 67 adult patients had not had regular household contact with children during the month prior to onset.

Seventy-three (65 percent) of the 113 cases had received no vaccination before onset; 11 (9.7 percent) had received one shot; 9 (8 percent), two shots; 19 (16 percent), three shots; and 1, four shots.

Severity of paralytic disability showed no significant correlation with number of vaccine injections, indicating that the vaccine provides all-or-none protection.

Distribution of tonsillectomy and bulbar paralysis did not indicate that previous (not recent) tonsillectomy disposes to bulbar paralysis.

This outbreak was probably due especially to accumulation of an unusually susceptible preschool population in public housing projects and similar low socioeconomic groups. This accumulation indicates unusual lack of natural immunization which, with the very low incidence of poliomyelitis during recent years and the changes in racial, socioeconomic, and geographic distribution of cases, suggests that extensive use of Salk vaccine did temporarily limit propagation of poliovirus in this community.

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RELATIVE EFFECTIVENESS OF DIETHYL TOLUAMIDE AND M-2020 AGAINST AEDES SCAPULARIS (RONDANI)

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FIELD TESTS of the effectiveness of the new insect repellent, diethyl toluamide, have been reported in recent years by Altman and Smith against *Aedes* spp. in Alaska (1) and by Gilbert and associates against *Mansonia* spp. in the Canal Zone (2), *Aedes aegypti*, *Aedes taeniorhynchus*, *Aedes* spp., and *Psorophora confinnis*, in Florida (3,4), and *Aedes dorsalis* and *Aedes* spp. in Oregon (5). Such tests have usually been based on the average protection time (the interval between application and first "confirmed" bite, that is, a bite followed by another bite within 30 minutes), and the ratio between the average protection time obtained with diethyl toluamide and that obtained with some "standard" formulation, either M-250 or M-2020. Results of these tests are summarized in table 1. The average protection time afforded by formulations containing 50 percent or more diethyl toluamide was more than 4 hours.

In each of the tests shown in table 1, the treated area was confined to the forearm of volunteer test subjects in an attempt to limit the high degree of variability inherent in this type of test, Travis (6) having proved that there were no significant differences in the results ob-

tained on any of the limbs. Unfortunately, we assumed as possibly other workers not thoroughly familiar with this test have, that the protection time based upon application of repellent to the forearm could be interpreted as the protection time to be expected for all exposed skin surfaces to which repellent was applied.

Background and Biological Observations

During a routine collecting trip in the vicinity of Brownsville, Tex., in May 1959, we encountered a relatively large population of *Aedes scapularis* (Rondani) in a wooded area approximately one-half mile west of Port Brownsville. In the United States this species is known to occur only in the lower Rio Grande Valley and possibly in extreme southern Florida. It occurs southward from Mexico and Central America to Argentina and in the Antilles (7). *A. scapularis* has successfully transmitted yellow fever virus from monkey to monkey under laboratory conditions (8).

Since routine application of a commercial preparation of 50 percent diethyl toluamide to all exposed skin areas gave protection for less than 1 hour, we decided to conduct additional tests that would produce results directly comparable to results reported by other authors and at the same time provide the following information:

1. Relative effectiveness of 100 percent M-2020 and 75 percent diethyl toluamide. (The Department of the Army is considering substi-

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tution of diethyl toluamide for M-2020 as the standard insect repellent for issue to the Armed Forces.)

2. Relative ability of 75 percent diethyl toluamide and 100 percent M-2020 to withstand removal by rubbing.

3. Relation between protection time on a single forearm and protection time on all exposed skin areas.

Tests were conducted in the Brownsville area on two occasions, June 17-19 and 29-30, using volunteers of Mexican extraction who were obtained through the labor office of the Texas Employment Commission, Brownsville. Because Travis (6) had proved that perspiration can influence the effectiveness of repellents, we required our subjects to remain relatively inactive

during the test periods. We discovered that the *A. scapularis* in this area landed and bit readily during the daylight hours, that activity began at sunrise, was prolonged into the twilight hours, and ceased during the hours of darkness.

Description and Results of Tests

For one series of tests of the relative effectiveness of diethyl toluamide and M-2020, equal dilutions of the repellents were used. One milliliter was applied to the forearms of each of 10 individuals, 50 percent diethyl toluamide to the right forearm and 50 percent M-2020 (diluted from 100 percent with ethanol) to the left forearm. Under the conditions of the tests, 50

Table 1. Published results of tests of relative effectiveness of diethyl toluamide and other repellents¹ in protecting against bites of various species of mosquitoes

Species	Location	Type test	Percent diethyl toluamide	Average protection time (hours)	Standard ²	Ratio diethyl toluamide to standard
<i>Mansonia</i> spp.: <i>titillans</i> (Wlkr.), <i>indubitans</i> D. & S., <i>fasciolata</i> (L.-Arr.) <i>nigricans</i> (Coq.) (2)-----	Canal Zone	Field	³ 100	5. 81	375	1. 12
<i>Aedes aegypti</i> L. (4)-----	Florida	Lab	⁴ 100	11. 1	M-2020	2. 13
<i>Aedes aegypti</i> L. (4)-----	Florida	Lab	⁴ 50	6. 80	M-2020	2. 43
<i>Aedes aegypti</i> L. (3)-----	Florida	Lab	³ 100	4. 15	M-250	2. 71
<i>Aedes taeniorhynchus</i> (Wied.) (4)---	Florida	Field	⁴ 100	9. 62	M-2020	1. 89
<i>Aedes taeniorhynchus</i> (Wied.) (4)---	Florida	Field	⁴ 50	6. 05	M-2020	2. 80
<i>Aedes</i> spp.: <i>communis</i> (DeG.) <i>punc-</i> <i>tor</i> (Kirby), <i>excrucians</i> (Wlkr.), <i>fitchii</i> (F.&Y.), <i>stimulans</i> (Wlkr.) (1)-----	Alaska	Field	³ 10	4. 68+		
<i>Aedes</i> spp.: <i>communis</i> (DeG.) <i>punc-</i> <i>tor</i> (Kirby), <i>excrucians</i> (Wlkr.), <i>fitchii</i> (F.&Y.), <i>stimulans</i> (Wlkr.) (1)-----	Alaska	Field	³ 25	6. 62	375	1. 69
<i>Aedes dorsalis</i> (Meig.) (5)-----	Oregon	Field	⁴ 50	6. 73	M-2020	1. 80
<i>Aedes dorsalis</i> (Meig.) (5)-----	Oregon	Field	³ 50	5. 60	M-2020	1. 45
<i>Aedes</i> spp.: <i>fitchii</i> (F. & Y.), spp. (dark legged) (5)-----	Windigo Pass, Oreg.	Field	⁴ 25	7. 45	M-2020	1. 92
<i>Aedes</i> spp.: <i>fitchii</i> (F.&Y.), <i>cinereus</i> (Meig.), spp. (dark legged) prob- ably mostly <i>communis</i> (DeG.) (5)-----	Diamond Lake, Oreg.	Field	⁴ 25	5. 42	M-2020	2. 07
<i>Aedes</i> spp.: <i>taeniorhynchus</i> (Wied.), <i>solicitans</i> (Wlkr.) (3)-----	Florida	Field	³ 50	4. 42	M-2020	1. 73
<i>Psorophora confinnis</i> (L.-Arr.) (3)---	Florida	Field	³ 25	1. 88	375	1. 20

¹ Applied at the rate of 1 ml. to the forearm except tests in Canal Zone where 0.5 ml. was used.

² Standards used at same dilution as test material in all instances. Composition of the standards as follows: 375: 1, 3-hexanediol, 2-ethyl. M-250: dimethyl phthalate, 60 percent; 1, 3-hexanediol, 2-ethyl, 20 percent; indalone, 20 percent. M-2020: dimethyl phthalate, 40 percent; 1, 3-hexanediol, 2-ethyl, 30 percent; dimethyl carbate, 30 percent.

³ Meta isomer.

⁴ Technical grade diethyl toluamide, ca. 70 percent meta isomer.

NOTE: Figures in parentheses are reference numbers.

percent diethyl toluamide gave appreciably more protection than 50 percent M-2020. The results are summarized in table 2.

In a second series of tests of relative effectiveness, 75 percent diethyl toluamide was compared with 100 percent M-2020. Other conditions of these tests were the same as described above. At these concentrations equal protection was afforded the test subjects by the two repellents, as shown below:

Repellent:	Mean protection time (hours)	Standard deviation (hours)
75 percent diethyl toluamide.....	5.22	0.50
100 percent M-2020.....	5.26	.62

The test of the relative ability of 75 percent diethyl toluamide and 100 percent M-2020 to withstand removal by rubbing was suggested by Dr. Carroll N. Smith and members of his staff at the laboratories of the Bureau of Entomology and Plant Quarantine, U.S. Department of Agriculture, Orlando, Fla. The procedure used was the same as that of the first series except that the forearms of the subjects were rubbed with a paper towel approximately 10 minutes following application of the repellent. The towel was wrapped around the forearm and slid under light pressure, 10 times on each arm, from the elbow to the wrist and back

to the elbow as the subject gently rotated his arm. With duration of protection as the criterion for determining resistance to rubbing, we found that 75 percent diethyl toluamide was greatly superior to 100 percent M-2020, as shown in table 2.

For a comparison of the relative effectiveness of a test repellent and a standard repellent, the paired forearm technique is undoubtedly the best method developed to date. From the standpoint of field utilization, however, the length of time that all treated exposed skin surfaces can be expected to repel biting insects becomes of primary importance. Undoubtedly, this time will be highly variable and dependent upon a large number of factors, many of which have not yet been identified and defined.

To gain information on this subject, additional observations were taken during the test with equal dilutions described above. All exposed skin areas were treated with undetermined amounts of 50 percent diethyl toluamide at a rate comparable to that recommended for troops in the field. The time at which the first confirmed bite occurred on any exposed skin surface was recorded. Omitting bites on the forearm treated with M-2020, the average protection time for all exposed skin areas was 3.73 hours. Including bites on the forearm treated with M-2020, the average protection time for all exposed skin areas was 2.61 hours. It was

Table 2. Relative effectiveness of diethyl toluamide and M-2020 against *Aedes scapularis* (Rondani) and ability to withstand removal by rubbing¹

Repellent	Mean protection time (hours)	Standard deviation	Mean difference in protection times (hours)	Standard error of mean difference in protection times (hours)	"t"	Probability of obtaining a larger value of "t"	Ratio diethyl toluamide to M-2020
50 percent diethyl toluamide ---- 50 percent M-2020-----	Relative effectiveness of equal dilutions						
	4. 23 2. 59	0. 44 . 38	} 1. 64	0. 170	9. 62	< 0. 001	1. 63
	Ability to withstand removal by rubbing						
75 percent diethyl toluamide ---- 100 percent M-2020-----	4. 52 2. 75	1. 01 . 97	} 1. 77	0. 274	6. 45	< 0. 001	1. 64

¹ 1 ml. of repellent applied to paired forearms of 10 subjects.

established in the test using equal dilutions that bites occurred sooner on the forearm treated with M-2020 than on the forearm treated with an equal dilution of diethyl toluamide. Hence it may be concluded that the average protection time, if all exposed areas of the skin had been treated with 50 percent diethyl toluamide, would have fallen between 2.61 and 3.73 hours. This protection time is appreciably less than the 4.23 hours obtained on a single forearm treated with 50 percent diethyl toluamide. Further investigation of these relationships is planned.

Summary

Field tests of the relative effectiveness against *Aedes scapularis* (Rondani) of the standard U.S. Army insect repellent, M-2020, and diethyl toluamide at various dilutions and under various test conditions were made. Compared with the current standard Army formulation, diethyl toluamide appears to be markedly superior when tested at equal concentrations. On the other hand diethyl toluamide at 75 percent strength gives protection approximately equal to that obtained with the current Army standard at 100 percent strength, although it is markedly superior to the standard from the standpoint of resistance to removal by rubbing.

ADDENDUM: Since this study was made, the Department of the Army has substituted 75 percent diethyl toluamide for 100 percent M-2020 as its standard insect repellent.

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Causes of Fish-Kills

First reports from 31 States indicate that agricultural pesticides and industrial wastes caused 70 percent of the 135 fish-kills attributed to pollution along more than 600 miles of streams and 5,000 acres of lakes from June to October 1960. The Public Health Service and the States are continuing the national collection of these reports in order to get some indication of nationwide prevalence and causes of fish-kills.

Fish-kills are deaths of varying numbers of fish in a specific area within a short period of time, usually occurring from foreign matter in a river. This may come from a large amount of chemicals or slow accretion of material that makes the water intolerable to fish.

The first nationwide study showed 73 out of 185 stream fish-kills were caused by agricultural poisons; 57 by industrial wastes; 15 by domestic sewage; 17 by other means such as pipeline breaks and shipping pollution; and 28 by unknown agents.

Federal Publications

Physicians' Age, Type of Practice, and Location. Health Manpower Source Book. *PHS Publication No. 263, Section 10; 1960; by William H. Stewart and Maryland Y. Pennell; 199 pages; 55 cents.*

Text, tables, and charts present basic data on age and type of practice of physicians according to their location in mid-1959 by region, State, county group, standard metropolitan statistical area, and county. Changes in age distribution and in the character of practice, grouped into six major categories, are indicated during the past three decades.

The number and location of osteopathic physicians, dentists, and veterinarians are also given, with a view to providing background information for persons and organizations concerned with the provision of health services for the civilian population.

Syphilis. Modern diagnosis and management. *PHS Publication No. 743; 1960; 63 pages; \$2.00.*

Directed to the general practitioner, the manual gives in concise form and comprehensible format most of what he needs to know in addition to his formal medical training to manage the average case of syphilis.

The importance of a detailed history and complete physical examination is emphasized. Dark-field and spinal fluid examinations, serologic tests, the course of syphilis, and manifestations of the various stages are described. Treatment, epidemiology, and special problems in diagnosis are discussed.

Forty-three color photographs of lesions, an annotated bibliography, and a note on source material are included in the appendix.

An Industrial Waste Guide to the Potato Chip Industry. *PHS Publication No. 756; 1960; 12 pages; 20 cents.*

Procedures for economic reduction or elimination of wastes which may reach fresh water streams are given.

Use of wastes as animal fodder, disposal of untreated wastes on agricultural lands, and stabilization ponds are discussed. Source and volume of wastes, factors which cause deviations from normal waste loads, and suggestions for meeting these deviations are also described.

The guide, prepared by the National Technical Task Committee on Industrial Wastes, is intended primarily for management and operators of the industry. It should be helpful also to consultants and regulatory personnel.

Sanitation in the Control of Insects and Rodents of Public Health Importance. Insect control series. *PHS Publication No. 772, part 4; revised 1960; by Wilfred H. Johnson; 46 pages; 35 cents.*

Proper storage, collection, and disposal of refuse are discussed with special emphasis on the sanitary landfill as an economical method of disposal for communities of 50,000 population or less.

The manual, directed to supervisors in health and sanitation departments at the local, county, and State levels, also lists references and audiovisual aids.

Public Health Service Grants and Awards by the National Institutes of Health, Fiscal Year 1960.

HEALTH RESEARCH FACILITIES CONSTRUCTION AND RESEARCH PROJECTS. *PHS Publication No. 777, part 1; 1960; 445 pages; \$1.25.*

TRAINING GRANTS, RESEARCH FELLOWSHIPS AND TRAINEESHIPS. *PHS Publication No. 777, part 2; 1960; 175 pages; 50 cents.*

National Goals in Air Pollution Research. Report of the Surgeon General's Ad Hoc Task Group on Air Pollution Research Goals. *PHS Publication No. 804; 1960; 39 pages.*

America's needs in air pollution research in the next decade are delineated in terms of 10 specific national goals and the requisite financial effort.

Areas covered include effects on man and agriculture, economic losses, measurement and identification, surveys and monitoring, meteorology and atmospheric reactions, control, administrative and legal aspects, and information, education, and training.

Besides briefly summarizing air pollution problems and trends, this report charts the cost of research needed to achieve each goal and the recommended allocations of financial responsibility among the Federal, State, and local governments and industry.

Fluorescent Antibody Techniques in the Diagnosis of Communicable Diseases. *PHS Publication No. 729; 1960; by W. B. Cherry, M. Goldman, and T. R. Carski; 73 pages; 45 cents.*

Designed for public health laboratory workers and others interested in applying fluorescent antibody techniques to the diagnosis of communicable diseases, this manual emphasizes the practical details of preparation, testing, and use of fluorescent antibody reagents.

Status of these techniques in relation to a variety of diagnostic problems in microbiology is discussed.

Pertinent procedures and information previously not easily accessible to the worker are given in the appendixes.

This section carries announcements of new publications prepared by the Public Health Service and of selected publications prepared with Federal support.

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